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Per. G.A. Wilts 8° 62

TWENTY-FIRST HALF-YEARLY

REPORT

OF THE

MARLBOROUGH COLLEGE

Natural History Society,

(FOUNDED APRIL 9TH, 1864,)

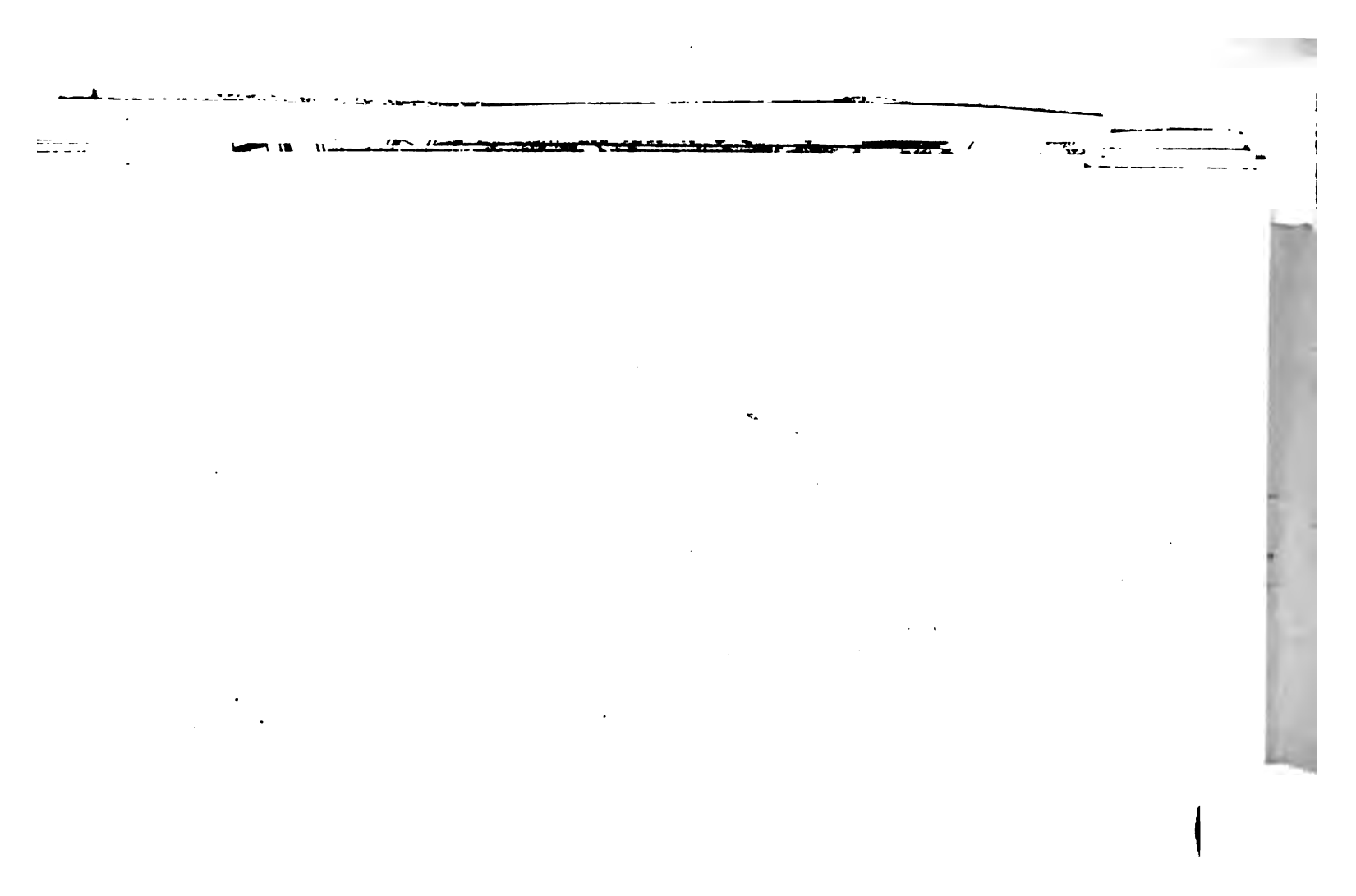
FOR THE

HALF-YEAR,

ENDING MIDSUMMER, 1875.

"Tum mihi Naturæ libeat perdiscere mores:
Quis Deus hanc mundi temperet arte domum."

MARLBOROUGH:
PRINTED BY C. PERKINS, TIMES OFFICE,
1875.



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1875.

PREFACE.

But few words of Preface are needed to the following Report, which the Committee venture to hope will not be found inferior to any previous one. They must, however, apologise for the very irregular order of the papers and notices, but various circumstances have rendered this unavoidable in the present number. The Committee beg especially to thank Messrs. Cassell for the use of the Plates to illustrate Mr. Rodwell's Paper on Sound, and also Mr. Stanford for allowing us to make use of his beautiful map of the Polar Regions to illustrate Mr. Beesly's Lecture on Arctic Discovery. The Society has certainly increased in numbers, so that the actual number of members is larger now than it has ever been; and as compulsory attendance at the sectional meetings has been enforced, it may be presumed that a very fair amount of work has been done. The very small number of General Meetings is apt to make the Society more disjointed than formerly, but the work of the Sections has been more real.

The Physical Section still continues to secure good work, the papers read at the meetings, and which appear in the Report, show that it still commands the interest of its members. The other sections have been doing more *real* work than formerly, the Geological and Botanical Sections meeting *weekly*, and having a course of lectures, those on Geology kindly given by W. H. Macdonald, Esq.; the reports, therefore, of these sections will be nothing but a statement of satisfactory work. The Archæological Section has been revived and seems to be doing good work.

The donations to the Society have not been numerous, but the following may be mentioned,—A collection of British Moths and Butterflies, including many rare species, by MRS. CONGREVE; a collection of Roman remains from Barbury Castle, by REV. HENRY HARRIS; a large specimen of Prepared Bark, used by the Mojos Indians, on the Upper Amazon, for making their shirts, the only clothing they possess; and two nests of Weaver Bird, by H. GRANT-DALTON, Esq. (O.M.); a collection of Mosses and Lichens, by MRS. DOWDING; Westwood and Humphrey's British Moths and Butterflies, 3 vols., by MRS. CONGREVE; Sir John Lubbock's Common Flowers in Relation to Insects (Nature Series), by REV. G. W. DE LISLE; Science Gossip, by REV. J. M. FULLER. Other additions to the Library have been made by J. ADAMS and D. H. DAVIES.

To the several donors the Society begs to return its sincere thanks, as also to those numerous friends in the town and neighbourhood, whose presence at our meetings shows much kindly interest, and some of whom have otherwise honoured us by becoming honorary members.

LIST OF MEMBERS.

President:
Rev. T. A. Preston.

Treasurer:
G. H. Dawson, Esq.

Secretary:
Lent Term. G. A. Lefroy.
Midsummer Term. J. N. Atkinson.

Librarian:
Lent Term. J. Adams.
Midsummer Term. D. H. Davies.

Committee:
The Ex-officio Members.
G. F. Rodwell, Esq.
C. R. Draper.
A. E. Garrod.

Honorary Members:

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W. R. Mullins, Esq.
Rev. J. Sowerby.
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Rev. G. G. Bradley, D.D.
C. M. Bull, Esq.
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G. K. Mills, Esq.

W. Mansell, Esq.
Rev. G. W. De Lisle.
W. Kooh, Esq.
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Rev. J. W. Mills.
J. Walker, Esq., M.D.
W. W. Fowler, Esq.
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C. Sankey, Esq.
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Rev. C. E. Thorpe.
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Rev. F. W. Farrar, D.D. F.R.S.

W. P. Sellick, Esq.
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H. J. Verrall, Esq.
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H. D. Drury, Esq.
Rev. C. Soames.
H. P. Dixon, Esq.
W. A. Clarke, Esq.
Rev. W. M. Furneaux.
Rev. A. C. Smith.

MEMBERS.

LENT TERM.—1875.

N. Whiting.
H. W. Thatcher.
W. M. H. Milner.
A. V. White.
T. G. Balfour.
W. M. Grove.
A. E. Garrod.
N. Manders.
F. G. Heaven.
C. E. Fox.
H. S. Philpot.
C. E. Blackett-Ord.
W. S. Robinson.
J. N. Atkinson.
R. Armitage.
J. B. Kite.
D. H. Davies.
J. Adams.
E. W. Brown.
J. H. C. Dalton.
E. P. Martin.
S. B. Pemberton.
W. L. Mackintosh.
J. P. Grant.
E. Marshall.
G. Mackintosh.
A. S. Bright.
C. R. Draper.
J. D. Rogers.
A. J. Burness.
F. S. Hockin.
E. F. Newman.
C. F. Dixon.
W. G. O. Cooper.
G. R. Askwith.
C. W. B. Jones.
F. L. Wanklyn.
G. M. Lawford.
L. G. Butcher.
F. E. F. Hooper.
F. H. Furnival.
F. H. Peeke.
J. Vans Agnew.
F. R. Drysdale.
O. Elton.
E. J. Reeves.
A. E. W. Blackburne.

MIDSUMMER TERM, 1875.

N. Whiting.
H. W. Thatcher.
W. M. H. Milner.
A. V. White.
T. G. Balfour.
W. M. Grove.
A. E. Garrod.
N. Manders.
F. G. Heaven.
C. E. Fox.
H. S. Philpot.
C. E. Blackett-Ord.
W. S. Robinson.
J. N. Atkinson.
R. Armitage.
J. B. Kite.
D. H. Davies.
E. W. Brown.
E. P. Martin.
S. B. Pemberton.
W. L. Mackintosh.
J. H. C. Dalton.
J. P. Grant.
E. Marshall.
G. Mackintosh.
A. S. Bright.
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J. D. Rogers.
A. J. Burness.
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E. F. Newman.
C. F. Dixon.
W. G. O. Cooper.
G. R. Askwith.
C. W. B. Jones.
F. L. Wanklyn.
F. E. F. Hooper.
F. H. Furnival.
J. Vans Agnew.
F. R. Drysdale.
O. Elton.
E. J. Reeves.
A. E. W. Blackburne.
R. F. Dixon.
G. R. Rogers.
A. G. Daubeny.
P. Burne-Jones.
M. Rogers.
T. A. Mackenzie.
T. A. Goddard.
F. W. L. Birdwood.
D. Vickers.
P. G. Hill.

STANTON PRIZES.

I.—The subjects for the Stanton Prizes will be divided into two groups:

(i) Botany and Physics.

(ii) Entomology, Geology, and Ornithology.

II.—Candidates will have to pass a Preliminary Examination in the elements of their own subject, and of one other of the subjects set for that year; after which, *if passed satisfactorily*, they will be examined in their own special subjects.

III.—In addition to these two Examinations, a certain amount of practical work will have to be sent in.

IV.—The books required for the preliminary Examination will be—

Botany—Oliver's Botany (chapters 1, 2, 3, 8).

Physics—Balfour Stewart's Physics (1s. edition).

Entomology—Dallas' Elements of Entomology (chapters 1, 2, and 3).

Geology—Bonney's Manual of Geology (1s., published by S.P.C.K.), chapters 1 to 6.

Ornithology—Stanley's History of Birds (chapters 2 and 3).

V.—The special subjects and practical work shall be changed every year, and shall be given out as soon as possible after the announcement of prizes gained for the previous year.

SUBJECTS FOR 1875.

The Prizes this year will be given for Entomology, Geology, and Ornithology.

(1) *Preliminary* Examination, see rule iv.

(2) *Special* Examination.

(a) Entomology—Dallas' Elements, chapters iv., xii.

(b) Geology—Remainder of Bonney's Manual and Jukes' School Manual of Geology.

(c) Ornithology—Remainder of Stanley's History of Birds.

(3) Practical Work.

(a) Entomology (i)—A Collection of British Butterflies; and (ii) Drawings of the *veins* of the wings of the different species.

(b) Geology (i)—A series of Marlborough Chalk Fossils, of all species.

(ii) A Map of the Country four miles round Marlborough.

(c) Ornithology—A Calendar of Observations kept from March 1st to June 30th.

RULES.

1.—That this Society be called the Marlborough College Natural History Society.

Constitution.

2.—That the Society consist of Members, Honorary Members, and Associates.

Officers.

3.—That the Officers of the Society consist of a President, Secretary, Treasurer, Librarian, and Curator.

Election of Officers.

4.—That the President have the absolute power of nominating the Secretary.

5.—That those Members of the Committee, who are not ex-officio Members, be elected terminally, and that the retiring Members be eligible for re-election.

6.—That the same rule apply to the Treasurer, Librarian, and Curator.

7.—That each candidate for election give in his name to the President, any time before the day of election.

8.—That all canvassing for votes by a Candidate, or by his friends with his knowledge, shall at once disqualify him for any election that term.

9.—That any Member canvassing for votes for a Candidate, or for a new rule, forfeit the right to vote on any occasion during that term.

10.—That the election of officers of the Society take place near the end of the term, but that they do not come into office till the beginning of the next term.

11.—That on the occurrence of any election, each Member of the Committee have double the number of votes of any other Member of the Society.

12.—That in the event of a vacancy occurring in the Committee or any other office to which Members are elected at the beginning of each term, the vacancy be filled up by the Committee.

13.—That eight Honorary Members have the power of debarring a candidate from standing for any office.

Management.

14.—That the affairs of the Society be conducted by a Committee, consisting of the President, Secretary, Treasurer, and three other Members of the Society, to be elected from and by Members of the Society; three of whom shall form a Quorum.

President.

15.—That in case of an equality of votes, the President shall have a double or casting vote.

16.—That in the absence of the President, the Committee be empowered to request any Member of the Society to take the chair.

Secretary.

17.—That the duties of the Secretary be to keep a list of all the Members of the Society, and of all former members and Benefactors who may wish to receive the Reports of the Society; to summon meetings, (when necessary) of the Society; to keep a detailed report of the proceedings, as well as lists of Members and Visitors present at each meeting, and generally to act under the direction of the Committee in all matters connected with the welfare of the Society.

18.—That in the absence of the Secretary from any meeting of the Society, minutes of the proceedings be taken by a Member of the Committee, appointed by the President.

Librarian.

19.—That the duties of the Librarian be to keep a catalogue of the Library, with the names of the Donors, and to see that the Library Regulations are carried into effect.

Curator.

20.—That the Curator be responsible for the order of the Museum, and when necessary assist the Secretary in the distribution of the Reports of the Society.

Library.

21.—That any Member of the Society be at liberty to consult any of the books belonging to the Society, but that only certain volumes, to be decided on by the Committee, be allowed to be taken from the room.

22.—That if any member wishes to take a volume from the Museum, he shall give his name, and the name of the book, to the Librarian, who shall enter them in the book kept for the purpose.

23.—That every volume so taken out be returned by the end of the term, but that no book be kept more than one month.

24.—That if any volume be damaged, such damage shall be reported by the Librarian to the Committee, who shall decide upon any further proceeding in the matter.

Museum.

25.—That any member of the School, who is not a member of the Society, be allowed access to the Museum at such times as it is open to Members of the Society generally, provided he first obtain leave from the President, which leave shall be renewed every term, but may be taken away at any time, if the privileges be abused in any manner.

26.—That members of the Society be permitted to use the Museum at such hours as the Committee shall appoint; but that in the afternoon it be used exclusively for the purpose of Natural History.

Botanical Garden.

27.—That the Garden be under complete control of the President, or of some person appointed by the President.

28.—That the Garden be open to Members of the Society at all times, and that each Member be allowed to introduce one visitor.

29.—That any Member on application to the President can have the charge of a bed.

30.—That no plant be put in without special leave from the President.

31.—That Members may keep any plants of their own in such places as the President shall appoint as long as the ground is not required.

32.—That the Society's flowers may not be picked.

33.—That Members may gather from their own plants but may not depute others to do so.

Field Days.

34.—That the Field Days be confined *entirely* to Members of the Society, and that the President appoint a day on which names must be given in.

35.—That any member, who has given in his name, must pay his share of the expenses, unless he is *unavoidably* prevented from going, in which case he must give notice at least three hours before the time of starting.

Members.

36.—That the election of new members rest entirely with the Committee.

37.—That every member pay a terminal subscription of 2s., to be paid at the first meeting of the Society in that term.

38.—That if a member be elected after the commencement of the term, the amount of his subscription for that term shall be settled by the Committee.

39.—That Members have the right to be present, to state their opinions, and to vote at all general meetings of the Society; to introduce two visitors at all general meetings of the Society; to have personal access to the Museum, and to introduce a visitor at such times, as shall seem fit to the Committee.

40.—That Members be considered as Probationary Members for the first term after their election.

Honorary Members.

41.—That Honorary Members have all the privileges of Members, except the power of introducing a Member of the School to the meetings of the Society.

42.—That Honorary Members pay 5s. a half-year, for which they shall be entitled to a copy of the Report.

43.—That Honorary Members may compound for all future subscriptions by the payment of a sum of two guineas.

Associates.

44.—That Associates be confined to members of VIth and Upper Vth Forms; that they pay 1s. a term, and be entitled to the use of the Museum, and to attend the meetings of the Society whenever they think fit, but shall not be entitled to vote on any question, to introduce a visitor, or to take books out of the Museum.

Visitors.

45.—That on such occasions when the number of those who wish to be present as visitors at the general meetings of the Society is greater than the number of Members who attend, the President and Committee shall be empowered to admit three or more each, as shall seem fit.

Suspension of Members.

46.—That any member be liable to be excluded from the Society by the Committee, if in their opinion, he shall have failed to show sufficient energy in the working of the Society.

Sections.

47.—That the Society consist of sections to be formed for the more accurate study of the different branches of Natural History, and that every Member must belong to a section.

48.—That the question of the number of Sections be left open for settlement at the beginning of each term.

49.—That no one may leave one Section for another during the term.

50.—That there shall be a definite number of Meetings of each Section during each Term, the number and days of meeting to be settled at a general meeting of the Society, to be held for that purpose at the beginning of each Term.

51.—That attendance of all members (except those of the VI Form) be compulsory at all the meetings of any Section to which they belong.

52.—That the Sectional meetings be open to any other members of the Society; or of the School, on application to the Heads of the Sections.

53.—That the internal control of the proceedings at each Sectional meeting be entirely in the hands of the head of that Section.

54.—That the Heads of Sections be appointed for each Term by the Committee.

Meetings.

55.—That there be two general Meetings of the Society each term, exclusive of the general preliminary meeting.

New Rules.

56.—That any Member of the Society have power to propose any new rule or any alteration in an old one, provided the motion be seconded by another Member.

GENERAL MEETING, MARCH 3RD, 1875.

A. H. BEESLY, ESQ., read the following paper on Arctic Exploration.
There was no time for exhibitions.
There were 149 Members and Visitors present.

ARCTIC EXPLORATION.

IT is six years ago since I read a paper on Arctic Exploration to this Society. Since then the subject has been more than once and eloquently followed up by others, and though I daresay not a single member of the School who heard my first paper is here to-night, I should hardly have ventured to re-tell the old story if it were not that in a few weeks or months at farthest we shall be once more sending out an expedition which is to attempt to reach the North Pole. The youngest of you is older than I was when all England was thrilling with hope or fear for the fate of Franklin. I trust no such anxiety will ever be experienced about the present expedition, but if, two years after it has passed into the solitary region round the Pole, no news should come of its whereabouts, it will be interesting to you who will then be eagerly scanning the papers every day for tidings, to remember that you have followed its fortunes from its outset. I thought first of giving you a concise account of the expeditions sent by England from the earliest times. But time would have failed me, and all I could have done would merely, I fear, have left in your ears the sound of many names and dates. I shall therefore begin at what I meant to be the end, and as briefly as I can show where our ships are now going and why they are going there, and then, if there's time, give you an account of one of the many feats of endurance of which the Polar region has been the scene. And apart from the present interest attached to this expedition, I shall not be sorry if I arouse in anyone the first sparks of enthusiasm for a study, or perhaps I should say a recreation which I can assure you is most fascinating. In the History of Arctic adventure you seem to come in contact with men who are almost all heroic. Here and there a piece of villainy or cowardice chequers the narrative, but as a rule it is a record of single-hearted bravery and self-sacrificing endurance which it would be hard to parallel in any other department of history. Perhaps just as mountain air makes a man capable of walking twice the distance he ordinarily can with half the fatigue, the Polar air braces the *morale* of explorers through their digestion, and converts the

man into a hero. Whether that prosaic reason has any truth in it, I can assure you that the taste for such reading steadily grows on you, grows on you just as the glamour of the North seems to fascinate explorers themselves who over and over again have escaped from the jaws of death, only to offer themselves again as volunteers in the same great quest. But I must waste no more words on a subject of which I should not soon tire of speaking, but proceed at once to the first division of my subject, viz., where we are going to, and why we are going there. Before you, (and the first thing I had better do is to name the land), you see a map of the Polar Region. Of that region more than 2¼ millions of square miles are still *terra incognita* or *mare incognitum* as the case may be. We now know that whether we sail westwards or whether we sail eastwards we must in the end come to Behring's Straits. These straits were discovered in 1728, and it was for some such passage that all previous discoverers had aimed. Our earliest venture was so far back as Alfred's reign. That was when Venice "held the gorgeous East in fee," and if an English or French ship ventured into the Mediterranean the ship was at once seized by the Venetians and the sailors sold as slaves. The produce of India was then brought by land to the eastern shores of the Mediterranean and carried in Venetian ships to Europe. It was to break this monopoly of the trade with India that we tried to find another passage there, but we now know it was an idle dream, and that this monopoly was broken not by us but the Portuguese when they doubled the Cape of Good Hope.

Many other voyages, however, were made with a mercantile object, and though an adventurous spirit soon led men northwards for the mere novelty of the thing, and though about the close of the 14th century the whole world was lit up by a flame of emulation which the discoveries of new worlds and a practically new literature had kindled, still we may say with pride that, to send out an expedition purely for honour's sake and the sake of science is emphatically a modern idea.

Whatever has been the object of all expeditions we may regard them all from three points of view. Some have sought a North West Passage, that is a passage to the Pacific by the north of North America, some a N.E. passage, that is a passage to the Pacific by the north of Norway and Siberia, and some have sought a North Polar passage, that is a passage straight across the Pole to the Pacific. As for the North Pole, I suppose I need tell no one what the term means. I don't know whether I have seen or dreamt of a cartoon in *Punch* of a pole stuck on the top of the globe with a bear at the summit, as you see a bear in the pit of the Zoological Gardens, defying all the keepers to entice him down. As the Arctic circle is so called because Ἄρκτος the constellation of the Great Bear is over that circle, that might do well enough as a caricature of the difficulties of Arctic discovery. But the Pole as you know is merely a name.

Imagine an apple twisting on a string run through the middle of it. The axis of the globe is an imaginary string on which it turns, and each end of that imaginary string is called a Pole. Whether there is water at the Pole or earth no one knows, and this is what we are going to try and find out now. The other two great objects of explorers have been obtained. By what heroic efforts, at the cost of how many noble lives England won the glory of having discovered the N.W. Passage, some of you know. Sir Robert M'Clure, entering by Behring's Straits, sailed between Banks Land and Prince Albert Land till stopped by ice, then sailed back and round Banks Land and out through Lancaster Sound and Baffins Bay, in 1850. He was engaged in the search for Sir John Franklin, who may be said to have discovered the North West Passage first though he did not sail all the way from the Atlantic to the Pacific. McClure sailed the whole way. Franklin only found first a bit of sea passage which was all that was necessary to connect the seas already discovered east and west. Franklin in fact connected the route discovered by Parry to Melville Island with the route discovered by himself and Richardson, and by Simpson and Dease, along the coast of North America. So that he discovered and discovered first one North West Passage, and McClure discovered another, both passages converging in Barrow Straits. In short the main result of the Franklin epoch was geographically to resolve the till then unknown region north of America into a group of islands. Of course people suspected some of them were islands before, but it was not *known*. Franklin himself sailed round Cornwallis Island for the first time, and by discovering Victoria Straits proved that Victoria Land and Prince Albert Land were all one island. By sailing down Franklin Straits he also proved Prince of Wales Land to be not part of Boothia and North Somerset. McClure proved Banks Land to be an island by discovering Prince of Wales Straits, and McClintock by discovering McClintock Channel, proved that Prince of Wales Land was not part of Victoria Land. Of course the North West Passage would have been discovered long before if it was not that these channels are generally choked by ice, so that it is quite a chance whether a ship can get through or not, and therefore till some ship has got through, and the problem *solvitur navigando*, it is quite uncertain whether the channel is a channel or only a bay. And now before I leave the story of the North West Passage, I will just show you where Franklin went on his last voyage. He sailed up Lancaster Sound, Barrow Straits, up Wellington Channel farther north than anyone had gone before, round Cornwallis Island, through Peel Sound and Franklin Straits, to the N.W. of King William's Island, where his ships were beset from September, 1846, to April, 1848. There he died in June, 1847, and was buried. Crosier and the crew set off April 26th, 1848, for Back's River, deserting the ships, and dragging a boat on a sledge. Some died on the way.

Some got to the continent, and were a long day's journey from the Back River when their strength or provisions failed them and they lay down to die. That is the story of the N.W. Passage. Parry did most towards finding one. Franklin actually found one first. McClure found another, and first actually sailed from one ocean to the other. Lastly, McClintock found yet another and found the record of Franklin's death.

Of the North East Passage I shall say but little. It has never yet been performed. That there is sea all along the coast is certain, for it has been tracked the whole line of the coast. But no ship has ever yet sailed round the N.E. Cape, or Lake Chelyuskin, though over the ice Chelyuskin doubled it in 1742, in sledges. Along the shores of Siberia there are no trees, but the land is frozen for many feet below the surface, and these expanses of frozen land are called Tundras. A more desolate region can hardly be imagined. It was in trying to make the North East Passage, in 1872, 1873, that Lieutenant Payer got fixed to an iceberg, which towing him north of Nova Zembla, brought him to a new land, which he called Franz Joseph Land. He came upon it about 700 miles from the Pole, explored it to about 560 miles from the Pole, and saw to about 495 miles from the Pole. There was land on his right, and land on his left, and islands in the intervening channel, up which he went for some 130 miles, so it is conjectured that the whole forms a group of islands. The shores of the land were more sterile than those of Greenland, and though at first he thought he saw at nearly his northernmost point an open sea, he soon found it was only a polynia or water pool (Polyi=Open), bounded on the north by a wall of solid ice. And now I come to the reason of our choosing Smith's Sound as the route for our expedition. Over and over again, east and west of Spitzbergen, in century after century, in fair seasons and bad seasons, one fate and one only has met every explorer who has tried to make his way far north. Sooner or later he has come to a vast solid barrier of pack ice, *i.e.*, of a number of floes or fields of ice packed together, through which no ship has ever forced its way.

Hudson, Poole, Fotherby, Phipps, Scoresby, Buchan, Clavering, and others, all examined this pack ice, west of Spitzbergen, and Hudson, Barentz, and others, and notably, Payer, examined it east of Spitzbergen, all with one result. This polar pack drifts south in summer and autumn. A drift begins from east to west in the summer months from Siberia, as is known from the wood found on Spitzbergen, and the probability (founded on the fact that as Parry went north the sea became deeper) is that the whole central region about the Pole consists of this enormous mass of pack ice, with islands here and there, of greater or less size. Now this summer drift is fatal to any attempt to get to the Pole by sledges. Nearly as fast as a sledge goes north the ice goes south, so that Parry found himself like

Sisyphus attempting an impossible labour. By ship, then, it has been proved impossible, and, by sledge, reason and experience combine to convince us it is impossible to reach the Pole by the Spitzbergen seas. Well, but why not try to reach it by Behring's Straits? The answer is that in those seas the pack ice is further south than in the Spitzbergen seas, and on a more formidable scale, being sixty feet thick, instead of forty, so that if the drift is less marked, the distance to be traversed by sledges would be far greater, and the surface of the ice less adapted for travelling. And so we are reduced to the one route of Smith's Sound. There the ice is on an average about six or eight feet thick. There land has been tracked further north than anywhere else. There the climate has been found to be warmer than in any equally high parallel of latitude. There many signs of animal life have been found. And north of the region delineated, tradition reports there is an island where musk oxen live, and where our explorers may find Esquimaux who have been cut off from the rest of mankind for centuries. Now let me describe Smith's Sound, and describe the plan of the expedition. The entrance is by Davis Straits, discovered by Davis in 1587. He sailed as far as Saunderson's Hope. Northwards is Baffins Bay, discovered by William Baffin in 1616, who named it Smith's Sound, after Sir T. Smith. With an eye to the main chance, he said—"It seemeth to be good for the killing of whales." This loop you see is Melville Bay. In summer the ice drifts down southwards, and a ship trying to get through must either take the west, middle, or east passage, of which the last is the safest. By getting beset by ice a ship often becomes helpless, or is crushed to pieces. But a good steamer has an immense advantage over an old sailing ship, because it can charge through thicker ice, and escape from ice closing in. Moreover if a south-west wind drives the ice up against the east coast, it is generally possible by splitting a dock in the ice-foot or solid ice clinging to the shore, to escape its pressure.

In the year 1816, two centuries after Baffin's discovery, that discovery was disbelieved. There are maps of that date, on which you will find a dotted line with this inscription "Baffin's Bay, according to the relation of William Baffin in 1616, but not now believed." Modern incredulity is not always infallible in that and other things. Well, Smith's Sound Baffin had discovered, and Ross in 1818 got there again, and named the capes at the entrance Alexander and Isabella after his ships. The entrance is about forty miles across. Up this sound Kane sailed in 1853, as far as the point you see marked, and his steward Morton got with a sledge to a higher point, whence he saw what he thought was an open sea. Dr. Kane is the one foreigner whom I should have been content to see reach the Pole before an Englishman; and it is a sad thing to think he died so young, when a few more years would have been of such enthralling interest to him. For

Hayes, his surgeon, went beyond Morton's farthest in 1861, and found that what was an open sea in 1854 was then ice. And this was the point Arctic explorers had reached when I read my last paper to this society. It was a strange sensation to me, a few years later, to read once more of the old names already become historical, to hear of that very Morton again going on another expedition to the Pole, to hear Petersen, whom Kane distrusted, praised and quoted as an authority; and once more to read of Hans the Esquimaux, whom Kane loved, and Hayes hated; and of the family which was found to have been the result of that elopement of Mr. with Mrs. Hans, of which I then spoke. For that very year in which I read my paper Captain Hall came home to America, and clamoured for another Arctic expedition. In 1870 he set out in a small river steamer, the Polaris, sailed through Melville Bay without stopping, and right away beyond Kane and Hayes, through Kennedy Channel, to a channel which he called Robeson Straits. He sailed from Cape Shackleton, 575 miles northward, in five days. Two men of the Polaris saw beyond latitude 84, that is to about 415 miles from the Pole. His ship was ice-bound, but, what was still more unfortunate, he, himself, who was a man worthy to be Kane's successor, died, and the next in command was of another spirit. Hans and Mrs. Hans were in the Polaris, and so was Morton. A stronger vessel could have easily broken through the ice; and to the north was seen navigable water, called now by the noble name of Lincoln. Moreover as they found that two tides meet at Cape Fraser, just opposite the Humboldt Glacier of Kane, one from the north and another from the south, it seems almost certain that Hall was close to the north coast of Greenland, and as it was an unusually favourable season, he could, no doubt, if he had come to no more land, and had not been stopped by ice, have reached the Pole in three or four days. In latitude 82 a piece of pinewood was found drifting south, which must have come from Siberia. As it was, nothing more was done. The ship got free, was again beset, and so severely nipped that the crew were got ready to abandon her. As she righted, however, part were on board, when part with the boats were left on the floe, and a marvellous voyage that party on the floe had, being on the ice from latitude 77½ to 58½, that is, for about 1650 miles, till they were picked up off the coast of Labrador. Among them were Hans and Mrs. Hans; and in latitude 82 a little Hans had been born to them, who has, we may reckon, a more northerly birthplace than any other human being.

The Polaris was run ashore and her crew passed the second winter near, and north of Cape Alexander. Here they constructed two flat-bottomed boats and set off south, being picked up by the sealer Ravenscraig, a little less than 29 miles S. E. of Cape York. With them were a man named Hayes (whether the Dr. Hayes of Kane's expedition, I don't know) and Morton.

The latter is an Irishman, and whether or no he had been indulging the lively fancy of his nation too much in his previous account, certain it is that the observations of Kane and Hayes had been proved to be somewhat erroneous, and Morton was much chaffed about the ocean he had discovered in 1854. Kane too, it was found, had placed Cape Constitution nearly 58 miles north of its true position. The shore of Greenland, where it has been seen farthest, is precipitous. It goes North only to lat. 82·30, and then trends eastwards. Grinnell Land on the contrary is low and shelving, with fast ice attached to it. It also at 82.30 seemed to trend westwards, while, nearly 70 miles to the North, land was seen. That land is probably an island, so up here our ship will go, and if there is a sea-lead go round the island, or if not the men will land on it and so make their way towards the Pole with a sledge and boats. Supposing they can get to this island they will then be a little over 400 miles from the Pole. The plan of the expedition is as follows: Two ships, the Alert and Discovery, the former a Royal Navy steam sloop of 751 tons and 100 horse power, the latter a whaler of 578 tons and 96 horse power, 166 feet long and 29 broad, will start at the end of May for the North. The Alert will be commanded by Captain Nares, and will carry 12 officers, 1 Naturalist, 2 Esquimaux or Danish dog-drivers, 4 Stokers, 7 Marines, and 36 Seamen, including 3 Icemasters engaged at Dundee. The Discovery's crew will consist of 59 men. The Captain who was in command of the Challenger has been in the Arctic Seas before, and his second in command, Captain Markham, has also been on a whaling voyage. The expedition will be well supplied with every sort of stores, including the best kind of pemmican, or meat deprived of fat, dried, and then beaten to powder. It will sail to Disco on the west of Greenland, fill up with coal there, take dogs on board, and then sail north if possible to lat. 83. If very lucky in the season it would probably sail higher. But it is intended that one ship should stop there and proceed to lay depôts along shore northwards, while the other ship pushes on for 200 miles, the farthest point whence communications can be kept up with its consort. Then it will stop also, and in the same spider-like fashion will proceed to lay depôts northwards. So that in the spring of 1876 a long line of depôts will exist, one half connecting the two ships, the other stretching towards the Pole and enabling the sledging party, which will then start on the forlorn hope, to carry a smaller burden, because stores will be found on the way in the depôts. Cairns will be erected at the entrance of, and along the shores of Smith's Sound containing records of the expedition; and a relief ship will be sent to the entrance of Smith's Sound if the expedition does not return before November, 1876, to which ship, if the Captain has been obliged to abandon his vessels, he and his crews will come by sledges and boats. If he thinks fit, he will stay longer with a part of the expedition and send a part only back to the relief ship. The object of the expedition is primarily to reach the north Pole

and so to achieve a distinction which generation after generation of Englishmen has striven for in vain. But many discoveries are hoped for in geography, geology, geodesy, magnetism, meteorology, botany, zoology, and perhaps ethnology. It is known, for instance, that North Greenland is being steadily upheaved, and on its shores may be found, if no living human beings, yet evidence of the condition of those regions at an earlier era. Which side of the channel the depôts will be laid, I am not sure. I imagine it would depend on the nature of the ice-foot, and will be probably on the west coast. I strongly hope that the northern ship will need to make no depôts at all, will find an open sea-track, and will triumphantly sail past Hall's farthest, discover Greenland and Grinnell Land to be islands, and sail to the Pole. But the chances are strong that they will do nothing of the sort. I cannot but fear that the cold weather we have had this winter augurs ill for our success. I think it far more likely that our ships will be stopped before they reach Hall's point, and that though we shall possibly by sledges get, this time, beyond Parry's farthest, we shall not succeed in reaching the Pole.

Before proceeding further, I wish roughly to describe the gradual discovery of the coast of North America, and if you follow with your eyes as I point to the map, this will not be difficult to remember. Behring's Straits, you recollect had been discovered in 1726. How were those Straits connected with the Atlantic? The first Englishman who ever set eyes on the Northern sea was Hearne—a daring adventurer whose discoveries were disbelieved and who in fact did romance a little though in the main his narative proved to be true. He reached the coast from the interior by the Coppermine River in 1770. In 1789 Mackenzie went down the River since called after him, thus striking the coast at a more westerly point than Hearne. In 1819 Franklin went down the Coppermine River and sailed eastwards from its mouth to Point Turnagain, tracing the indentations of the Coast so far. In 1825, Franklin sailed down the Mackenzie River, and he and Richardson parted at its mouth, the latter going eastwards and along the coast to the Coppermine River, while he himself turned westwards, hoping to reach the point, already known, called Icy Cape. He did not get so far and named his farthest point Return Reef, but by this joint exploration a great piece of the coast had been delineated. In 1834 Back discovered the source of, and descended the Great Fish River now called after his name. He attempted to reach Point Turnagain from its mouth but failed. Thus the sea was reached at a third point and the coast, if not explored, was roughly known from Return Reef to Back's River. In 1837, Messrs. Dease and Simpson completed the survey of the coast from Icy Cape to Return Reef, and in 1838 went from the Coppermine River beyond Franklin's farthest eastern encampment, but not as far as Back's River. In 1839, however, they not only reached Back's River, but sailed round the peninsula of Adelaide and sighted a part of

Boothia. Lastly, in 1845—47, Dr. Rae explored the peninsula of Boothia. And so the whole coast was mapped out by the gradual discoveries of these hardy travellers in a little less than eighty years.

And now, as I have thus sketched the history of Arctic enterprise, and of North American discovery in outline, I will try, though it is very hard to do so in a few minutes, to give you some idea of one of its episodes. Some of you may be familiar with it already, but I fancy a good many of you only know Sir John Franklin as a name, and will not be sorry to make a little closer acquaintance with him. Just as in our generation, Kane and Hall, and Mc.Clintock and Mc.Clure are household words, so in the previous generation were Parry and Franklin, and Richardson and Back. Round the names of Parry and Franklin, some of the proudest recollections of Englishmen must always cluster. Dear friends in life, in death they will never be divided. They toiled in the same field for the same object, and rarely has any nation been able to boast of possessing two friends of such lofty, pure, and disinterested characters.

The object of the expedition I am going to describe, was to make scientific observations of the Aurora Borealis, &c, and determine the latitudes and longitudes of the Northern Coast of America, which, in that quarter, had never been seen as yet by any European except Hearne in 1770, and also to trace the trend of that coast from the mouth of the Coppermine river eastwards. Franklin hoped to reach Repulse Bay on the East, where Middleton, in 1742, had seen a frozen strait. Westwards of that point, the coast was only known by Indian rumours, and Franklin sailed with the hope of being able to place on our maps its outline. He also meant to place conspicuous marks along the coast which might be seen by Parry, who was then attempting to find a North West Passage by Repulse Bay, which was not then known to be only a Bay. Franklin sailed in 1819, furnished with letters to the Hudson's Bay Company, and the North West Company, which then divided the fur trade of North America. The officers of those Companies were directed to give him every help, and the point he first made for was York Factory, the chief establishment of the Hudson's Bay Company on the west shore of Hudson's Bay. Here he expected to get information as to whether it would be best to go from east to west, or from west to east in his explorations, and also as to his chances of an escort of Indians which he hoped to obtain on his way. He sailed, then, in May 1819, and off the island of Resolution the expedition nearly came to an end. The ships were in a thick mist for days, and the currents drove them along violently without their knowing where they were. Suddenly the fog lifted, and a few yards off they saw a towering rocky coast on which directly afterwards the ship struck. I cannot stop to tell minutely how they thought shipwreck certain, how one of their consorts disappeared in the mist and was no more seen, how the water gained on the

pumps though even the women on board worked at them, how a heavy gale rose and the ice closed in round them, and how by desperate exertions they got at the leaks, crammed felt in, and drew a sail under the vessel over them and fastened it with ropes. Suffice it to say, that after much hardship they reached Fort York at last, on the 30th of August, and the first sight which gladdened their eyes was that of their lost consort riding snugly in the bay. At York Factory, Franklin finally determined to make for the Coppermine River by Cumberland House and the great Slave Lake, and to track the sea shore, from west to east. On September 9th he set out from Fort York, but had to leave a quantity of stores behind. The Governor assured him he could get tobacco, ammunition, and spirits at the other stations of the Company, so Franklin asked him to send on the residue next season, and the first fatal mistake was made not by him but his advisers. The route lay over a wild country in which lake succeeded lake, and river river, with strips of land intervening, across which they had to haul their boats. Such a passage is called a portage and most fatiguing labour it must be. 690 miles of such toil they accomplished, and on October 22nd, 1819, reached Cumberland House.

On the way, however, they had been obliged to leave 16 pieces of their stores to be forwarded by the Hudson Bay Company the next season. At Fort Cumberland, Franklin left Midshipman Hood and Richardson, and on the 18th of January set out with Back for Fort Chippewan because he thought it necessary at once to make arrangements for his Indian escort and for the route north of the Great Slave Lake, with which no one at Fort Cumberland was acquainted. He reached Fort Chippewan on March 26th, having travelled in mid-winter in the same way as before, 857 miles, and passed the Hudson Bay stations of Carlton House, Isle à la Crosse, and Pierre au Calumet on the way. At the last place he heard that the provisions at Fort Chippewan were at a low ebb, that many of the hunters were disabled by an epidemic and that he would have great difficulty in getting an escort of Canadian Voyagers or Indians to the sea, owing to their dread of the Esquimaux. Franklin was glad to get to the Fort for he had suffered great agony from his snow shoes, each of which weighed between two and three pounds, and had galled the feet and made the ancles swell till the pain was almost intolerable. On July 13th he was rejoined by Mr. Hood and Dr. Richardson who brought some of the stores left behind but ten bags of pemmican or dry pounded meat were found to be mouldy, so that they had to start northwards with only one day's supply of this essential article. Meanwhile, Franklin during his stay at Fort Chippewan had organised the Expedition. Some Coppermine Indians had agreed to meet him at Fort Providence, and, on condition of Mr. Wentzel, one of the agents of the North West Co. accompanying them, to go with Franklin to the coast, a rough scheme of it and of the route to it having been obtained from some of them. On the 18th of July, 1820, the Expedition left Fort Chippewan.

It consisted of 3 canoes, 16 Canadian Voyagers, one faithful Englishman John Hepburn, a Chippewan woman, and the four English officers. It was to be joined at Fort Providence by two Canadian interpreters, Mr. Wentzel, and the Indians. They visited the station of Moose Deer Island, 260 miles from Fort Chippewan on July 25th, having come most of the way by water, and on July 29th reached Fort Providence 76 (statute) miles beyond Moose Deer Island. Here they met Wentzell, and Akaitcho, or Big Foot, the Indian Chief, who agreed to go with them to the sea and hunt for them on the way. Franklin had meant to go down the Mackenzie River, and thence by the Bear Lake to the Coppermine River, but now he was forced to keep nearer the North West Company's Establishments on the Slave Lake in order to get ammunition in the winter. And so at last they set out on August 2nd, 1820, to carry out the main object of the whole Expedition. Five Englishmen, seventeen Voyagers, three Interpreters, Mr. Wentzel, and the Indians made up the whole. They were miserably provisioned, and in 4 days had eaten their chief supplies, henceforward having to live mostly on fish and the proceeds of hunting. On August 20th they reached a spot 553 miles from Fort Chippewan, where it was proposed to winter. Here they built a house called Fort Enterprise, a hut which will live in men's memories when many a real Fort famous in its day has been forgotten for ever. After settling the hut Franklin proposed at once to leave it and set out for the Coppermine River, and descend it to the sea. But Akaitcho refused. After much debating the latter said "Well, I have said everything I can urge to dissuade you from going on this service, on which it seems you wish to sacrifice your own lives as well as the Indians who might attend you; however, if after all I have said you are determined to go, some of my young men shall join the party, because it shall not be said that we permitted you to die alone after having brought you hither; but from the moment they embark in the canoes, I and my relatives shall lament them as dead." To such an appeal there was no real answer, and the idea was given up. So that winter the party stayed at Fort Enterprise, living chiefly on rein-deer meat. The cold was intense. The trees froze to their very centres and became as hard as stones and harder to cut. Some of the axes were broken daily. At last they had only one left. The carpenter alone was allowed to use it, and if that had broken before they got others it would have been a serious matter. But others were brought by Mr. Back who went to Fort Providence to arrange for the convoy of the supplies left behind at Fort Cumberland. The fish froze as they were taken from the nets and were then split open with a hatchet and the insides taken out. After thus being frozen they would recover life again when thawed by fire. A carp leaped about with much vigour after it had been frozen for 36 hours. Such spirits as they received were proof, but they froze and when thawed flowed out, of the consistency of honey. Mr. Back went back as far as Fort Chippewan

travelling 1104 miles on snow shoes, with no covering at night in the woods than a blanket and deer skin when the thermometer was frequently at—40° and once at—57° being moreover sometimes for two or three days without food, only to find that part of their stores had not come from Fort Cumberland owing to an officer's misconduct, and that the chief of Fort Providence was spreading false reports about Franklin among the Indians. The fact was, this man thought Franklin was coming to compete with his company, and he refused to honour the requisitions on him which Franklin gave to the Indians. The latter consequently became suspicious. Luckily Akaitcho was a sensible man and was under Franklin's influence, but still the conduct of Mr. Weeks led to great mischief. However, though food and ammunition were low, Hood and Franklin made expeditions to the Coppermine River to prepare for the descent of it in the summer. One amusing and one serious event occurred during this period. They had an Indian guide named Keshkarrah. His daughter was called Green Stockings and was the belle of the tribe. So Mr. Hood wished to take her portrait. But for a long time her mother refused, because she said the King of England if he saw it would fall in love with her and send a force to take her away. She was not 16, it may be observed, and had already been married twice. The serious event was that the Canadians bringing the stores from Fort Providence broached a rum cask on the way. Not only was this a serious loss in itself, but it augured ill for the honesty of these men, an omen fatally fulfilled afterwards. Two important persons had now been added to the party, Julius and Augustus, Esquimaux who it was hoped would interpret, if they fell in with hostile Esquimaux near the sea, and who proved to be most faithful, sturdy, and cheerful fellows, better than any of the other men except Hepburn. The Canadians in fact were beginning to be afraid of the journey and were secretly urging the Indians to keep Franklin on short commons so as to daunt him. In April few fish could be got, the Indians sent no meat, and the pounded meat left was almost gone. Sometimes they only got one meal a day. The Indian families whom the hunters had left at the Fort scraped up the snow to find bones, deer's feet, bits of hide and other offal which they boiled down to get the nourishment out of them. Franklin pitied them then, and I ask you to remember that fact.

After much bickering with Akaitcho he and Franklin at last came to terms. Mr. Wentzel was to go to the sea with him, but not to embark on it. He and the Indians were to come back and lay depôts of provisions for Franklin's return-march, and especially to make a large depôt at Fort Enterprise. The long-wished-for day came at length, and on June 14th, 1821, the expedition set out for the Coppermine River. I must skip the details. On July 18th, when they were twenty or thirty miles from the sea, they came on traces of Esquimaux who could not be induced to listen

to their overtures of friendship, but fled from them. This so alarmed the Indians that they determined to go back, and St. Germain and Adam, the two hunters and interperters, asked to go too. This was not allowed, but Mr. Wentzel went with the Indians having promised Franklin to see that the depôts were made at Fort Enterprise. The party were now reduced to twenty, and when they reached the mouth of the Coppermine River, they had travelled 334 miles from Fort Enterprise. The sight of the sea scared the Canadian voyagers, as much as that of the Esquimaux had scared the Indians. But Hepburn was delighted, and the officers also were glad to be on an element with which they were familiar, and at last to be at the work for which they had been dispatched from England. I can't stop to describe the voyage. They never got half way to Repulse Bay, but mistaking Bathurst Inlet for the main trend of the coast, went a long distance—174 geographical miles—out of their way. Two bags of pemmican, their chief reliance, became mouldy, and the farther they went, the more frightened the Canadians became, and the more eager to return. At last, when they had travelled 646 miles, though they had come not more perhaps than between 300 and 400 as the crow flies, they turned home at a point they called Cape Turnagain. On the very day they did so, Parry curiously enough sailed out of Repulse Bay, which was 539 miles off. Franklin had originally intended to go back to the Coppermine River, and return by the way he had come, so as to pass by the depôts he had ordered the Indians to make. But he had now just half a bag of pemmican left, so he was forced to take another route, and sailed to the mouth of the Hood River, up which he meant to go as far as it was navigable, and then after constructing some small canoes out of his big ones to make the best of his way with them to Fort Enterprise.

And now I come to one of the most tragic histories ever told. One might call it pathetic, but that, as Thackeray says of the circumstances of George III's madness, it is too terrible for tears. Nevertheless, no one could read Franklin's diary and not be touched. It was, it must be remembered, written from night to night, after the day had been spent in one of the most frightful of all torments, starvation, and when death seemed to draw visibly nearer hour by hour. It is as if he had written it with his heart's blood, which to the last drop he was determined should be shed for those at home in England. There is no unmanly wailing in it. It is the most matter of fact record of appalling sufferings. Perhaps the most tragic feature of it is that at one point the dates cease. Whether he had lost count of time I do not know. The diary does not cease though the dates do. Perhaps the record of those days was added afterwards, because however willing the spirit was, he found it frequently impossible to pen his notes upon the spot.

On the 25th of August they reached Hood's River, and they set out for Point Lake (149 miles off, as the crow flies) on the way to Fort Enterprise, each man carrying about ninety pounds weight, and they advanced about a mile an hour. Those who carried the canoes had the hardest work, for snow fell on September 1st, and the bearers constantly fell down, and as the ground was covered with small stones, and they had only soft moose skin shoes, it was painful to walk. However, they shot some musk oxen at starting, and with food they could have borne all. But, on the 4th, Franklin writes—"As we had nothing to eat, and were destitute of the means of making a fire, we remained in our beds all the day, but the covering of our blankets was insufficient to prevent our feeling the severity of the frost;" and the drifting of the snow, which was three feet deep outside the tents, and several inches on the blankets. They were without fire, and without food, but hunger was the worst pang of all. On the morning of the 7th they set out again, having had only a little portable soup since the 4th. One meal of it was still left. Franklin fainted on trying to walk, in consequence of exhaustion and exposure to the wind. At the men's request, he, though he at first refused, took a morsel of the soup and so went on. The snow was a foot deep. The swamps over which they passed were frozen, but often let them knee deep into the water, and the canoe bearers were constantly blown down, or slipped on the stones. At last the biggest canoe was so broken as to be useless—and worse than this—to them terrible disaster, because the other canoe was too small to carry their party across, Franklin suspected it was done on purpose by Benoit, one of the Canadians. However, making the best of a bad job, they lit a fire and cooked the last remnant of the portable soup. After this they sometimes shot a few partridges, but lived chiefly on *tripe de roche*, a glutinous lichen which they scraped from the rocks. It allayed the pangs of hunger, but afflicted some of them with terrible maladies; Mr. Hood being the chief sufferer. They were always stumbling, where to break a limb meant death, for they could not have carried anyone now. At last, on September 10th, they saw a herd of musk oxen, and the hunters went in chase. They crept to them so cautiously that they took two hours to get within gun-shot. The others watched breathlessly, offering up prayers for their success. The hunters fired, at last, and to their extreme joy one cow fell. It was cut up and skinned in a few minutes. The contents of the stomach were devoured raw, and all the rest of the inside was pronounced by the most dainty to be delicious. This was the first real meal they had had for six days, and oddly enough they felt weaker after it than before. The wretched Canadians, it was found, had thrown away the fishing nets to get rid of the weight, and now it was found necessary to leave behind most of the instruments, and a few books they had carried, and take only ammunition, clothing, and the instruments

requisite for finding their way. It was afterwards found that the hunters had kept to themselves some of the partridges they had killed, but Perrault, one of the Canadians, generously gave the Englishmen some scraps he had saved from his allowance. On the 19th they were faint from hunger, and having to march through snow two feet deep, against a piercing wind, the cold cut their enfeebled frames, and they dropped and broke the second canoe. Yet it is on this day Franklin records the following as the nightly routine. On halting, each man, if they could get a fire, thawed his shoes, and put on dry ones, wrote notes on the day's events, after prayers were read, ate such supper as there might be in the dark, and lay down in his blanket, keeping up a cheerful conversation till sufficient warmth came to admit of sleep. Often however, they had to lie down in wet clothes, and were afraid to take off their boots lest they should be frozen so hard that they would be unable to put them on next morning. They had patched up the canoe, but on the 22nd, Peltier, who was in charge of it, came and said it had been again dropped and was useless, and refused to go back for it. "This," says Franklin, "caused me anguish impossible to describe." Some of the men found some deer bones left by wolves. They burnt them in the fire and ate them, seasoning their meal with part of their old shoes.

Next day they dined again off their shoes and some other scraps of leather, but on the next had the luck to shoot five small deer. Franklin now sent Mr. Back and the interpreters on ahead to get as fast as possible to the Indians and try and procure meat. The rest soon afterwards found a putrid deer, which they greedily devoured. The loss of the canoe was soon fatally felt. They came to a stream which they must cross or die in going round it. They made a raft but could not steer it for want of oars. Dr. Richardson took a rope and actually tried to swim across, and this in spite of treading on a dagger just before, which cut him to the bone, but as he reached the other side he sank, and they had to pull him back. On stripping him the sight of the skeleton he was seemed to open the eyes of all of them to their desperate condition. "Ah que nous sommes maigres" exclaimed the Canadians. Dr. Richardson had lost all sensation in one side and did not completely recover it till the next summer. On the 1st of October Mr. Back rejoined the party, being forced to try to cross at the same place. They managed to make a canoe and found the antlers and back-bone of a deer. The marrow though putrid and though so acrid as to take the skin off their lips, they divided carefully and eagerly ate. Mr. Hood was now a mere shadow, and Dr. Richardson was lame. The former could not eat the tripe de roche and the men stole a partridge reserved for him. They no longer felt hungry, but dreamt of eating all night long. At last St. Germain managed to get the canoe across, and the rest were drawn over one by one. Mr. Back, St. Germain, Belanger and Beauparlant were then sent on to Fort Enterprise to the depôt there and to

find the Indians, and many of the party thought their difficulties over. But next day, Oct. 5, Crédit on reaching the night's encampment was unable to stand. The tripe de roche had broken down Hood and this man and Vaillant. They supped that night on some bits of leather, and next morning breakfasted on the remains of their old shoes. On Oct. 6th Samandré came to Franklin who was ahead and said Crédit and Vaillant could go no further. Dr. Richardson went back and found Vaillant lying down unable to move. Crédit was farther behind and was seen no more. Richardson could give no help, but Belanger came back and took up Vaillant's bundle. The strongest of the party were in vain entreated to try and bring him to the fire. On the contrary they demanded leave to throw away all loads and make for Fort Enterprise as fast as they could. This would have meant death to the rest, but it was necessary to do something at once. Mr. Hood resolved to remain behind with one attendant, where next they should find tripe de roche that would last 10 days. The generous Richardson and Hepburn said they would stay too. They hoped Crédit would join them as he had his blanket and some bits of leather to eat.

It was a terrible parting. Hood felt he was endangering the safety of the rest, and Franklin felt that was his motive, but he also saw that another day's travel would kill him, and hoped before ten days were over to send meat from Fort Enterprise. So the rest set out. But when they had gone 4½ miles Michel and Belanger were far behind, and on encamping were utterly broken down. They burst into tears and asked to be allowed to go back to Hood. Next morning their request was granted, and they were left at the camp fire to set out after the rest had started. Just before starting, however, Perrault and Fontano became dizzy, and though they were revived with some morsels of burnt leather, the others were dismayed and said they could not move. Franklin managed to get them on their journey, but Perrault soon became faint, burst into tears, and asked to go back to Michel and Belanger. They watched him till he was nearly at the fire and then went on. They had to march over ice and slipped at every step, and were so weak that the wind kept blowing them over. Fontano fell repeatedly, and overwhelmed with grief said he must stay where he was. With intense anguish Franklin saw another of the party drop behind, but there was no help for it, and he could only urge Fontano to try and rejoin Michel and the rest, and sorrowfully watch him staggering away in that direction.

And now only five persons were left, Adam, Peltier, Benoit, Samandré, and Franklin. For four days they had no food except one meal of tripe de roche. One hope alone buoyed them up, the hope of reaching Fort Enterprise. And at last, O welcome sight! the fort came in view. Now they would find food, and more than that be able to help those behind them. Alas, alas! The hut was desolate. There was no depôt. There was no trace of Indians.

There was not even a note from Mr. Wentzel to explain why. All they found was a note from Mr. Back saying that he had suffered the same disappointment, and was going to try and reach Port Providence, or the Indians. Can you conceive a more appalling situation? All Franklin says is "I resolved also on going in search of the Indians" after a day or two's rest, to recruit the four men who were incapable of going on at once. And now they set to work to collect such refuse as the Indian women I asked you to remember had rejected, and were overjoyed to find some deerskins and bones. The women had picked the bones, but *they* had learnt to eat them. They saw deer but had no strength to shoot them, and Franklin's limbs swelled so the day afterwards that he could not stir. On October 13th Belanger came in speechless and covered with ice, with a note from Mr. Back saying that he had found no Indians and asking for instructions. Belanger was sent away when he had recovered to tell Back Franklin intended starting for Fort Providence as soon as he could. And here I may mention that Back had been enduring privations almost as bad as Franklin, as you will see by and bye. Franklin found Belanger had been trying to entice away Adam his only hunter, and to induce him to steal the one kettle he had, which would have involved the death of the party. To such villainy misery had reduced the best of the Canadians. Augustus the Esquimaux had meantime reached Fort Enterprise. Adam became so ill that he could not travel, and as Peltier and Samandre said they would stay with him, Franklin set out with Benoit and Augustus. They only got over four miles in six hours, and next day Franklin broke his snow-shoes and was obliged to return to the hut. It was a sad return. Adam and Samandré were in bed too ill to rise, and day after day Franklin and Peltier watched them, and themselves grew weaker and weaker, till at last whenever they sat down it was only by the greatest efforts they could rise again. Still however they conversed cheerfully, hoping the Indians would come, and one day Franklin heard Peltier cry out "ah! le monde!" and steps were audible outside. It was the second and most terrible surprise, for in walked Hepburn and Richardson with the news that Michel and Mr. Hood were dead, and Perrault and Fontano had not been seen. Hepburn brought a partridge and it was the first meat Franklin had tasted for 31 days. Dr. Richardson begged Franklin not to speak in such a sepulchral voice, never noticing that his own voice was equally sepulchral.

And now I must give you Richardson's narrative. Soon after Franklin's party had left, Michel returned, but without Belanger who, you may recollect had been left with him at the fire and who, he said, had set out before him for Mr. Hood's encampment. They set out for a better camping place of which Franklin had told them in the note Michel brought. Michel went off for a day and returned with what he said was part of a wolf he had shot, which they ate. Mr. Hood became worse, and Michel grew sulky and would

hot hunt. One day Richardson left Hood arguing with Michel and Hepburn near them cutting wood. Hearing a gunshot he came back and Hepburn ran to him saying Hood was dead. They found he had been shot from behind and that Michel must have done it. The latter accused them of suspecting him and never gave them a chance of conversing together till two days later when he stopped behind to clean his gun. He was much the strongest and best armed of the three and they felt sure he would shoot them when his gun was ready. Hepburn offered to shoot him, but when Michel came up Dr. Richardson pulled out a pistol and shot the wretch through the head, feeling that if the deed was to be done he ought to do it himself. The one satisfaction one has in reading this long tragedy is that the shot which slew this Iscariot did not miss its aim. It was too plain what he had done. First he had murdered Belanger. Then Perrault had come back to the fire and he had murdered him too, and what he called a piece of a wolf was part of one of their bodies. Then he had killed Mr. Hood, and was preparing to kill the two others when Dr. Richardson shot him. And now to return to the main story. After Richardson's return Peltier got weaker and weaker and on November 1st he slid on to his bed and they thought him asleep till hearing a rattling in his throat they went and found him speechless, and that night he died. Samandré had been a little better and had even been pounding bones, but he immediately became very melancholy and next day he too died. And now Adam became worse and worse, his looks being ghastly and his talk incoherent, though Franklin to cheer him lay by his side at night. And all of the party became peevish and half light-headed, each fancying the other silly and himself very wise, and that his advice on the most trifling matters ought to be attended to. But they repented instantly of each piece of pettishness and once Hepburn exclaimed " Dear me, if we are spared to return to England, I wonder if we shall recover our understandings." On November 7th Adam was clearly near death, when the report of a musket was heard and directly after three Indians entered the tent. Mr. Back had reached Akaitcho's tents and sent them with meat.

On October 4th, 1821, Back had left Franklin's party for Fort Enterprise. With him were St. Germain, Belanger, and Beauparlant. Belanger fell through ice over his hips and was nearly frozen on the 6th. This man three times did the same thing. I have just told you how he came in afterwards to Franklin's party after a similar mishap. On the 6th Back was so weak that he could not hold out his arms, and as his shoulders were so painful that he couldn't bend to let them hang down he was obliged to use a stick to extend them. The same day glances had been cast at one of the party which he might have easily interpreted into the horrible longing of a cannibal. But really it was a certain old pair of leather trowsers which was coveted, and it was the *pièce de résistance* of the evening meal. On the 8th they were

constantly blown over by the wind and on trying to cross a frozen lake it blew them back faster than they could get on. At night having no *tripe de roche* they supped off an old gun-cover and a pair of old shoes. They managed to reach Fort Enterprise which as has been related above they found deserted, and nothing could be done but go on to Fort Providence 130 miles off. They fortified themselves for this journey with some burnt bones (not what we understand by broiled bones, by any means) and bits of deerskin and set off. Mr. Back and all of them became very weak on the 14th. He seems to have been the strongest man of Franklin's party. I told you of his 1100 miles trip before. And he was as brave as a lion, and perhaps some of you may, if you live near him, remember his story when you see him next, for he is alive, and as Sir G. Back is one of the supporters of the present expedition. He says " Beauparlant's face became so dreadfully swelled that he could scarcely see. I myself lost my temper on the most trivial circumstances and was become very peevish. The day was fine but cold with a freezing N.E. wind. We had nothing to eat." On the 15th he says, "I was so much reduced that my shoulders were as if they would fall from my body, my legs seemed unable to support me, and in the disposition in which I then found myself had it not been for the remembrance of my friends behind who relied on me for relief, as well as the persons of whom I had charge, I certainly should have preferred remaining where I was to the miserable pain of attempting to move."

On the 16th they were awaiting Belanger's return, for he had as you remember been sent to Fort Enterprise for Franklin's instructions. Beauparlant became very weak and on nearing the place where they were going to camp for the night he said "Take your axe Mr. Back, I shall join you by the time the encampment is made." The others went on and seeing some crows about, St. Germain said there must be a dead animal somewhere near. Directly after they saw above the snow some deer's heads peering over the snow without eyes or tongues. Wolves had killed them and then left them, being driven away by the severity of the weather. With one voice Back and St. Germain cried out "Merciful God we are saved." They encamped, but as Beauparlant did not come up St. Germain went to look for him. Soon he came back and said Beauparlant was dead. He had found him stretched upon his back on a sand bank frozen to death, his limbs all extended and swollen enormously and as hard as the ice near him. His bundle was close by as if it had rolled away as he fell, and the blanket he wore round his neck and shoulders was thrown on one side.

On the 18th Belanger returned, too weak to tell all his tale at once. St. Germain broke out weeping, and Back when he read Franklin's letter did the same. Belanger would have killed himself then and there by eating if they had let him. After eating for two hours, chiefly skin and sinews of deer, he complained of hunger. And here I may mention that when the Indians

brought meat to Franklin's party, the latter ate so as to inflict frightful torments on themselves. Dr. Richardson warned them they must not eat much at first, but they paid no heed, and he, even while he spoke, went on eating himself, and was as ill as any of them. The weather was now so cold that ice formed within two ft. of their camp fire. They packed up deer sinews enough to last eight days, at one meal per day, and then started on the march to Fort Providence which they calculated they could reach in fourteen days. "We could," says Mr. Back, "but be unprovided with food for six days, and this we heeded not with the prospect of obtaining full relief before us." On November 3rd, he was so exhausted that he must have remained at the next encampment when they came on tracks of Indians, and so was saved himself, and sent relief to Franklin.

I have constantly mentioned the Indians, and as they played an important part in the expedition, I will say a word about them here. They had made no depôts, partly because they firmly believed Franklin and his men would never come back again, but die on the way; and partly also because Mr. Wentzel found Fort Providence destitute of ammunition, so that he could not supply them with the means of hunting The North American Indians are divided into several tribes, such as the Dog-ribs, the Crees, the Strong-bows, the Rocky Mountain Indians, and the Chipewans. They have a tradition of the deluge. Some of them think they are descended from a dog. They are named after their dogs, and till a young man is married he is considered the father of a certain dog. When the dogs fight, the women say to one of the combatants "Are you not ashamed to quarrel with your little brother?" and the dogs slink off as if they really are ashamed. Five years before Franklin came, a fanatic had persuaded one tribe that to use dogs was unfilial, so to avoid the impiety, they oddly enough slew every dog they had, and had to drag everything for themselves on sledges. They have a queer tradition of a sort of Evangelist having left them a species of religious code in a far off land from which they had been driven by the rising of the waters, and had come on a raft across straits which had since been frozen. It is possible this dimly alludes to some long distant emigration from Asia across Behring's Straits. Besides their traditions of a deluge, they have other things in common with Europeans which won't be quite unfamiliar to you. To Cumberland House in 1819, came a certain Conjurer who boasted that although his hands and feet were tied as securely as possible, yet when placed in a conjuring-house he would speedily disengage himself by the aid of two or three familiar spirits. The Englishmen took him at his word, and promised him a great coat if the spirits looked sharp. He entered his tent, and was fastened with several fathoms of rope. Then he began to chant a very monotonous hymn, a sort of Indian Gregorian, I suppose. The rest of the Indians stood round in great doubts respecting the powers of a devil when put into competition with those

of a white man. One hour and a half elapsed when the tent shook violently. "Ah" said the Indians, "One devil has gone under the moose-skin." But after another half hour it was found that the conjurer was shaking with cold. The thermometer was very low and this Indian Davenport, pluckier than his brother swindlers of Europe, had gone to work stripped to the skin. At last he gave it up as a bad job, for an expert sailor had tied him up, and he took the earliest opportunity of sneaking away from the Fort.

The chief Indian I have mentioned was Akaitcho. He was a mixture of craft and generosity very strange to read of. You have heard how he failed to keep his promise about the depôts. But when Back and Franklin reached him at last in utter misery, when he knew their stores had not come to Fort Providence, and when they could not pay him any of their debts, he behaved most generously. "The world goes badly," he said, "all are poor; you are poor, the traders appear to be poor, I and my party are poor likewise; and since the goods are not come in, we cannot have them. I do not regret having supplied you with provisions, for a Copper Indian can never permit white men to suffer from want of food upon his lands without flying to their aid. I trust, however, that we shall, as you say, receive what is due next autumn, and at all events it is the first time that the white people have been indebted to the Copper Indians." It is satisfactory to know that before Franklin left the country he was able to redeem all his promises to that chief.

And now I must leave those who have been at all interested by this narrative to read for themselves the rest of it, how Franklin and his men reached Akaitcho, how kindly they were treated, how they came to Fort Providence and found letters informing him that he and Back, and poor Hood had received promotion at home, how, when their journey of 5559 miles was over they set out again for England, and how the faithful Hepburn had a snug berth given him when he got there. Here my story must end—but, I will tell you one thing more. They returned to England in 1823. And Franklin, Richardson, and Back actually volunteered for another expedition to the same region in 1824. All of us, I think, may be proud that we are of one blood with that Triumvirate.

P.S.—On Whit Monday, May 17th, I was to my extreme gratification enabled to go over the Alert and the Discovery. I was conducted over the former before the rush of tourists began by one of her crew, and a crew of right good fellows they must be if he was a type of them. Short but very strongly built, he had a face brimming over with good humour, and, on parting, I could hardly get him to shake hands, because his, he said, were not quite clean, or to take a trifle for the trouble to which I had put him. Just as we were leaving the ship he spoke of the ice-masters. "That's one" he said, pointing to a coffee-coloured shortish man with brown curly hair, "he's a

Dane and the dog-driver." "Why, what's his name?" I asked, guessing who it was. "Petersen" he replied. I looked closely at Mr. Petersen, for I could not forget Kane's opinion of him. May he be as faithful to the Expedition as I am certain my guide will be in good fortune or in ill.

I should have much liked to talk to one of the Officers. Captain Markham, who hastily pencilled an order for admission to the Alert, was so civil that I was tempted to ask him some questions, but he was very busy and it would not have been fair to take up his time. Everything looked spick and span on board, and there did not seem to be an inch of room unutilised. I could scarcely stand upright with my hat on anywhere even in the Officers' quarters. After I had bumped it repeatedly and rubbed my coat well at every turn in the Discovery, my conductor remarked he thought the paint was mostly dry now. The provisions for this year are stored ready to hand along the ship's side, under the main deck. Those for next year are in the hold. The pemmican is not tempting-looking stuff, being more like dog-biscuit than anything. Every iron pillar or rail in the ship is sheathed in leather to keep the hands from being skinned by the scorching effects of the cold. The Naturalist's cabin is fitted up with a row of tiny compartments to hold specimens. The Doctor's seemed incapable of holding many drugs, and as the sick berth had been given up to the fourth lieutenant who in his turn had been ousted by the Chaplain, physicking and illness is evidently not expected to play an important part in the expedition. To a landsman's eye the ships did not seem especially strong, and the preparations for encounters with the ice which must have been manifold and elaborate were not apparent. One device for unshipping the rudder our guide spoke of with enthusiasm. That operation had been effected in four minutes, and he seemed loth to acquiesce in the verdict of the ice-masters, that it took just three minutes too long. They were Scotch he said, with a chuckle, and you couldn't understand a word they said. However, on their recommendation, a rougher and readier apparatus of a pole and a hook was going to be used, instead of the present device, though I couldn't quite see how it was to be made to work. The mode of turning the ship into a winter house was described, the funnel of the engine being laid down, and canvas erected tent-wise across the deck. A circular-shaped receptacle round the stove pipe was destined to hold snow, which, when melted by the heat of the stove below, will supply the ship with water in winter. In a tent, outside, was all the apparatus of the expedition, sledges, ice-axes, portable boats, tents, and ice-anchors, &c.; and I noticed that there was a label on everything recording its weight to an ounce—a fact which showed the exact prevision necessary in such an undertaking. A dummy man was rigged out in the costume to be worn by those travelling in the cold weather, and to shake its duffel-gloved hand seemed to be the favourite amusement of the sight-seers. A duffel cap coming over the forehead, a big pair of

spectacles over the eyes, a duffel flap across the nose and mouth, a double-breasted duffel coat, long gauntlets and stout leggings and shoes,—so was the figure made up, and not a morsel of the face or body, except about an inch of each cheek-bone could be seen. The sledges were wonderfully light and handy, and the folding boat only weighed 28 pounds. Evidently all that ingenuity and foresight could do, had been done in the equipment of the expedition.

I stood for a long time after leaving the ships, watching the boats being got aboard and the faces of officers and crew. Some were merry-looking, like my guide, and some were grave, but all that I saw had a tough, weather-beaten, energetic look.

Before these pages appear in the Natural History Report, they will have bid a long good-bye to friends and home, and the glory of the blossoming year, and begun to face stern realities, the nature of which many of them perhaps in the gaiety of preparation have never yet precisely calculated. I am afraid they will have started rather too late, and that they have not hit on the best of seasons. But no one could feel despondent who had seen the ships and the men. Faces, words, and actions alike marked them as

"Strong in will,
To strive, to seek, to find, and not to yield."

Good luck go with them.

GENERAL MEETING, APRIL 2ND, 1875.

G. F. RODWELL, ESQ., read the following paper, illustrated with experiments, on Sound.

There were 72 persons present; 28 Visitors, and 47 Members of the School.

THE SCIENCE OF SOUND.

I WISH to bring before your notice this evening, some of the principal facts connected with the Science of Sound: to tell you what sound is; how it is produced and propagated; by what means the impression of it is received and identified by the brain. The sensations to which we give the names Light and Heat, are modes, qualities, kinds, of motion,—so is *Sound*. When the particles of the optic nerve are moved in a particular

manner, we call that motion, light; when the particles of the sensory nerves are moved in a particular manner, we call that motion *heat*; similarly when the nerves of the ear are moved in a particular manner, we call that motion *Sound*. Motion is inseparable from sound; whether it be the body which emits the sound, or the medium that transmits it, or the organism which receives it, in all cases we have motion. Here is the great column of air dancing up and down in an organ pipe, and making all the wood-work in the vicinity dance up and down in company; here is a great parchment-headed drum, which when struck throws into motion the surrounding air, and so may set in motion, on a review-day, or on the field of battle, ten thousand smaller drums in the heads of everybody within ear-shot; here are the great cords of a contrabasso, set in motion by drawing over them a rosined bow; here is your great bourdon that weighs ten tons, and takes three men to set in motion its ponderous and sounding sides. In every instance we are dealing with the real palpable motion of masses.

But this real palpable motion appears at first sight to be confined to the visible moving masses, and we have next to enquire by what means the motion of the sounding body is transmitted to our ears. We say that sound is motion, but we cannot have motion in the abstract; there cannot be motion without something to be moved, and that something must be matter. We see the light and feel the warmth of a body, a hundred millions of miles away, and these motions are conveyed to us by the intervening medium; similarly we hear church bells chiming a mile away, and there must be something to convey the motion of the bells to our ears. That something is the *air*. Without the air we should hear no sound at all. Since sound is motion, where there is nothing to be moved, there can be no sound. If the great bell of Moscow, itself, were hanging in this room, and if we could pump all the air out of the room, we might look in at the windows and see a great ton-clapper hammering away at the sides of the bell, but we should hear no sound. The great bell might be swinging through half a circle, and converting into heat a thousand foot-pounds of work at every stroke, but no traces of sound would reach our ears, because we should be separated from the bell by a vacuous space, and in that space the bell would find nothing to which it could communicate its motion. On the other hand, if we were to pump into the room more air than it usually contains, to condense many rooms-full of air into the room, the noise outside would be deafening, and the big clanging bell would batter down the walls by the impact of the air, which it would set in motion. Within a diving bell, some distance under water, the air is compressed by the liquid pressure above, and a whisper becomes as loud as the ordinary voice. On the other hand, on the top of a high mountain, where the air is rarefied, the ordinary voice sounds no louder than a whisper. A pistol fired on the summit of Mount Blanc sounds no

lounder than a cracker; and I suspect the ordinary voice of an inhabitant of Quito, or Potosi, or the plateau of Thibet, would sound to us like the voice of a giant, and all the sounds of nature must be deadened in their ears. Cold condenses air, as well as pressure; in the cold, still, homogeneous air of the Arctic regions, men can converse at great distances apart. I believe, I have somewhere read, that a conversation has been held between two persons separated by a mile. If an inhabitant of Potosi were taken to the Arctic regions, his voice would be deafening; while if an inhabitant of Northern Greenland were taken to Potosi, his voice would sound like a whisper. In a word, at Potosi, nature opposes the transmission of sound, while in the Arctic regions nature relatively promotes it. The cause of these effects is simple enough: if ten cannon balls will batter down a wall in ten minutes, five will do it in twenty minutes, and twenty will do it in five minutes. If we diminish the density of the air one half, half as many particles will strike the ear in a given time, and half as much motion will be conveyed to the aural nerve. On the other hand, if we double the density of the air, twice as many particles will strike the ear in a given time, and twice as much motion will be conveyed to the aural nerve, or as much in half the time, or half as much in a quarter the time, as if the air possessed its normal density.

It is easy to prove that the motion we call sound requires matter for its transmission. I have here a bell which can be caused to ring by clock-work: if I set it going, and place it beneath the air-pump receiver, we still hear it ringing, for it sets in motion the air within the receiver, and the air sets in motion the glass sides of the receiver, and they in their turn set in motion the external air, which directly communicates with our ears. Moreover, the bell stands upon the metal pump-plate, and communicates motion to it also. But, if I now place the bell-stand on several thicknesses of flannel, so as to prevent it from communicating the motion to the pump-plate, and if then the air surrounding the bell be pumped out, the sound gets fainter and fainter, at last we do not hear any sound at all; although we can see the clapper hammering away at the bell as briskly as it did when we commenced. If air be now admitted, the sound is heard to get louder and louder, and at last when the receiver is once more full of air, at the ordinary pressure we hear the bell as loudly as at first. All matter, solid, liquid, and gaseous, conveys the motion of sound. If we once more exhaust the receiver, and then let in oxygen, or carbonic acid, or steam, or ether vapour, in fact any gas or vapour we hear the bell.

We thus perceive that before we can perceive the impression of sound we must have: (*a*) a body possessing motion of a particular kind, to initiate the sound: (*b*) a substance to convey the motion: (*c*) an organ of

sense to receive the motion: and *(d)* a special set of nerves to transmit the motion to the brain.

First, as to the nature of the particular motion which imitates sound. All sound is motion, but all motion is not sound: we know that a variety of motions produce no sound at all; as when a pendulum swings, or a wheel turns round, or when we walk, or move our arms. You shall here observe that there may be many kinds of motion; in nine cases out of ten the motion that we see is simple progressive motion in a straight line; or we may have simple circular motion, as that of a wheel. It is not difficult however to find examples of far more complicated forms of motion:—for example the motion of a fives' ball continually reflected until it falls; the motion of a ball repeatedly thrown up and caught by a juggler at a circus who is galloping round in a small circle the while; or our own motions at this moment as we drift through space in a right line with the whole solar system, and simultaneously move round the sun, and round the axis of the earth. But the motion of sound is not so complicated as these, it is mid-way between our examples of simple motions and complex motions. It is a to and fro motion, a motion backwards and forwards across a position of rest, a motion *va-et-vient* as the French say, a motion of *vibration*, or *oscillation*, not progressive but alternating. Such a motion as we get if I jerk this india-rubber rope; you can multiply examples, a pendulum, a stretched membrane like a drum head, a brass ball on the end of an elastic steel wire moved from its position of rest; the ears of corn when a gentle breeze brushes their surface. The strings of a violin vibrate backwards and forwards across a position of rest, so does the column of air in an organ pipe or other wind instrument, so does the parchment of a drum, so do the sides of a bell. But note that for the initiation of sound the body must vibrate *at a certain rapid rate*: a pendulum (Fig. 1.) vibrates just as truly as a tuning fork, but the motion

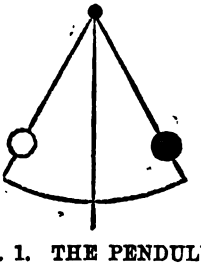

FIG. 1. THE PENDULUM.

of the former which produces no sound is much slower than that of the latter which produces much sound; the motion is the same in kind but differs in

degree, in rate. Vibrating bodies set in motion the surrounding air; the particles of air first set in motion, strikes the set of particles beyond them, and thus the motion is conveyed to our ear.

This mode of transference may be easily illustrated:—allow ten or twelve solitaire balls to rest in contact in the groove at the edge of the board, then if the ball at one end of the row is withdrawn a little distance and allowed to run back it will be seen to strike the ball at one end, the motion will be conveyed through the row of balls, none of which will move, and the ball at the other end will be thrown off. Or better suppose you ranged yourselves in a single file chain extending say between the C House porch and the gates, in such a way that your faces were all turned towards the gates, and each of you placed his hands on the shoulders of his next neighbour. Then if a sudden push were given to the individual nearest the porch it would be seen to be transmitted through the whole chain, and the individual at the gates would be thrown forward on his face; or if a drum were placed in front of him he would fall against it and set it in motion; or if he stood on the edge of a precipice he would be thrown over. The impulse might originate a thousand yards away, the result would be the same, each individual of the chain would transmit the impulse of his neighbour, and thus it would travel to the end of the chain, and obviously the longer the chain the longer it would take to travel. It is precisely thus that the motion of a vibrating body is transmitted through the air.

A body in motion does work; a cannon ball beats down the walls of a town, a flowing river turns a score of millstones; if sound be motion it ought obviously to be capable of doing work. And this has been often observed: the sound of cannon can break window panes, and has been known to break the drum of the ear. I have seen sixteen panes of glass broken by the noise of the explosion of a small bladder full of two explosive gases, and I know that our aural nerves were so rudely jarred that we did not recover our hearing for several days. Again a celebrated singer (I think Catalani), by pitching her voice to the note emitted by a glass tumbler, and sustaining the note, could break the tumbler by accumulated impulses. When an elastic medium like air which is conveying sound comes into collision with a body which it cannot move,—a body which cannot accept its motion,—it acts exactly like other bodies in motion under the same circumstances, that is to say it produces *heat*. The air now set in motion by my voice is striking against the walls of this room, and producing heat by impact.

I say the air or other intervening body is set in motion by a sounding body, and conveys the impulse to our ear, and it is obvious that this motion must travel at a certain rate. In our supposed chain of individuals it will obviously take longer to transmit an impulse through a chain of an hundred

and fifty reaching to the Pavilion, than through a chain of fifty reaching to the Gates. The velocity of the impulse will increase as the distance increases. An easy method of determining the velocity of sound in air was suggested by Lord Bacon two hundred and fifty years ago, and no better method has since been devised. In his *Historia Soni et Auditus* he says:—"The inquiry concerning the space of time in which sound is carried along can be determined by this method. Let a man stand in a bell-tower by night, and another stand on a plain about a mile off, or as far as it is possible to hear the bell, and let him have at hand a torch, lighted but covered. Then let him in the bell-tower strike the bell, and the other who stands on the plain raise the torch as soon as he hears it. By this method, from the space of time between striking the bell and seeing the torch, he who stands in the bell-tower can discover the time of the motion of the sound." Some very accurate experiments made near Paris by this method have proved that sound travels at the rate of 1,100 *feet* per second, while light and radiant heat travels at the enormous rate of 186,000 miles per second, and electricity at the rate of 288,000 miles per second. It is obvious that Bacon's method of determining the velocity of sound depends on the fact that light travels practically instantaneously between two places a few miles apart, while sound takes a much longer time. Yet the velocity of light is great compared with any ordinary rates of motion with which we are familiar for 1,100 a second is more than 800 miles an hour;—a velocity ten times greater than that of our fastest express trains, and in round numbers equal to that of a rifle bullet.

Sound spreads in every direction from a sounding body. A sounding body is the centre of a vast sphere of vibrating air, the surface of which sphere is found at the extreme limit to which the sound can reach. Let us suppose that A represents a body emitting sound, and b, c, d, e, f, g individuals placed at equal distances

A b c d e f g

apart, say 1100 feet. One second after the bell has been struck one blow, b hears the sound, a second later c hears it and b has ceased to hear it, for the impulse has passed him; a second later d hears it while b and c has ceased to hear it, and so on for the rest.

The velocity of sound is not the same in all substances, for instance in water the velocity is 4 times greater than in air; in tin 7½ times, in silver 9, in copper 12, in ebony 14, and in iron 16 times greater than in air. The velocity in water was determined in the lake of Geneva by ringing a bell under water and at the same instant exhibiting a torch; a distant observer who was furnished with a kind of ear trumpet, the lower end of which was beneath the water surface, noted the exact difference between the time of seeing the light and hearing the sound. Then the distance between the observers

divided by the number of seconds which elapsed between seeing the light, and hearing the sound, would obviously give the velocity of sound in water. The difference in the rate of motion between a solid and air may be distinctly noticed by the following means. Let an observer place his ear at one end of a considerable length of metal piping—for example lead water pipes or iron gas pipes, then if the pipe be struck at the end remote from the observer he will hear two sounds, one transmitted by the metal of the pipe, the other by the air within it, and the former sound will be heard before the latter.

The solids and liquids composing the body of an animal can transmit sound to the organs of hearing, if all communication with the external air be cut off. Thus Chladni has shown that two persons stopping their ears can converse with each other by allowing their teeth to touch the same piece of wood or metal; and I have certainly heard that a deaf person can hear every note of a piano if he holds one end of a stick between his teeth, and allows the other end to rest on the sounding board of the piano.

When a ray of light falls upon a mirror it is unable to penetrate it, and unable to set it in motion, it is consequently thrown back or *reflected*; the same thing happens in the case of radiant heat, as the reflectors of our kitchens demonstrate. It is equally apparent in the case of more tangible moving matter: a fives' ball is reflected when it strikes the wall of the court; and a billiard ball is sometimes reflected five or six times from the cushions before it comes to rest. In fact every elastic body in motion is turned back or reflected when it impinges upon an unyielding surface; and since air is an eminently elastic body, it is reflected when conveying the motion of sound, whenever it strikes against a surface which cannot assimilate or absorb its motion. This reflected sound is called *Echo*, after the unfortunate daughter of Aer and Tellus, whose loquacity so displeased Jupiter that she was condemned to answer only those questions that were addressed to her.

Suppose that we stand in a large rocky ampitheatre and shout or fire a gun, the sound-wave will spread in every direction in gradually enlarging circles like the ripples on a pond until it reaches the rocky barrier; but here it meets with an obstacle; the rocks cannot assimilate the motion and the sound is consequently reflected, like sea-waves dashing on a rock-bound coast. The sound travels back at the same rate that it travelled forwards, viz., 1100 feet a second; thus after the first report of the fired gun, we hear a second due to the reflected sound or Echo. The reflection of sound may be easily illustrated. I have here two mirrors, a section of which parallel to the axis gives us a parabolic curve, such mirrors having the property of reflecting all motions incident upon them to a point in front of them called the focus. I place the mirrors eight or ten feet apart and exactly opposite to each other, and hang a watch in the focus of one of them; as I recede from the watch the ticking becomes fainter

and fainter, at length I hear it no more. But if I place my ear at the focus of the other mirror the sound is distinctly heard, although the distance is far beyond the limit of audibility without the reflector. We find a precise analogy in the case of light and heat: a brazier of coals hung in the focus of a large mirror will produce sufficient heat to cook meat at a distance of more than 50 feet if the rays are received upon a second mirror and brought to a focus. This reflection of sound explains also why my voice sounds much louder to you if I speak through this tube than if the voice expanded into the air at once. Speaking trumpets, and ear trumpets are also illustrations of the fact that sound can be reflected, and we all know to how great an extent the acoustical properties of buildings depend upon their shape and dimensions. In all cases of reflection, whether it be the billiard ball, or sound, or light, or heat, the angle of incidence is equal to the angle of reflection.

Curious echoes are met with in various parts of the world, depending on the form of the reflecting surface and other causes. Near Syracuse there is an artificial cavern about a hundred feet long gradually narrowing to the top, and known as the "Ear of Dionysious." Sound is reinforced in it in a marvellous manner, the report of a toy cannon is far louder than that of a sixty-eight pounder at the same distance, and the reverberation is like that of a thunderstorm just overhead; if a piece of paper be flipped with the finger it sounds like the report of a gun, and the ordinary voice is augmented in intensity to a wonderful and painful extent. At the far end of the cavern a hundred feet from the floor, and much more from the speaker, a voice can be distinctly heard, even although it may not be more than a whisper.

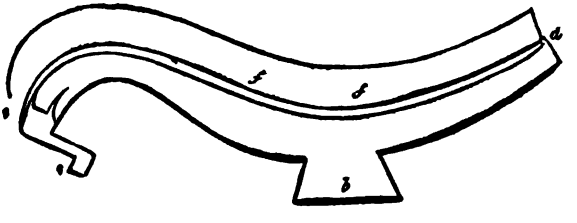

FIG. 2. PLAN OF THE EAR OF DIONYSIUS AT SYRACUSE.

Fig. 2 represents a plan of the cavern: c is the entrance, d a small cell at the top a hundred feet from the floor, where sounds can be heard with the greatest distinctness; f a large groove thirty inches in breadth, and in the middle of the roof,—this acts as a tube to transmit the sound; b is a recess on the right hand-side of the cavern, for what purpose it is difficult to say. It is said that, Dionysius placed prisoners in this cavern, and stationed a sentinel in the cell at d, so that he might hear every whisper they uttered.

According to Kircher a duett sung within the cavern has the effect of a loud quartett. The same author gives an account of several curious echoes in his *Musurgia* and *Phonurgia*. By an arrangement of side walls something like the walls of a fives' court, it is possible to obtain an echo with variations: thus if you say

Tibi vero gratias agam, quo clamore!

The echo taking up the last word and pulling it to pieces as it gets weaker and weaker as in Fig. 3 replies

Clamore.—Amore.—More.—Ore.—Re.

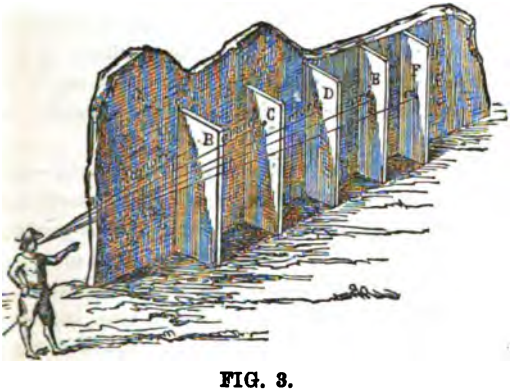

FIG. 3.

Ebell asserts that there is an echo at Derenbourg near Halberstadt which distinctly repeats the twenty-seven syllables of our old friend and phrase:—

Conturbabantur Constantinopolitani.

Innumerabilibus sollicitudinibus.

Cardan gives a story of a man who suddenly coming to a river, could find neither bridge nor ford; whereupon he heaved a deep sigh, which an unknown echo repeated. He now believed that he was not alone, and commenced the following conversation:

"Can I cross?"

"Cross," replied the echo.

"Here?"

"Here."

But observing a dangerous and swift current, he demands once again.

"Can I cross here?"

To which the echo replies, "Cross here."

Then the man began to fear that he was the sport of an evil demon, and he returned home without attempting to cross the river, and related his adventure to Cardan, who could not explain it. In the Cathedral of Girgenti

owing to peculiarities in the structure of the roof, the slightest whisper is conveyed from a point, near the western door to a portion of the Cathedral, near the high altar. Unfortunately there was once a confessional near the western door, and much that was never intended to be heard, save by the priest, was heard by people in the other part of the Cathedral who were in the secret. But, says M. Radau, who tells us all these stories in his "Acoustique," the best echo in the world is at the Lakes of Killarney, for if you say "How do you do," it promptly replies "Very well, I thank you."

Sound can not only be reflected after the manner of light, and heat, but it can also be *refracted*; that is to say, the motion on passing from a medium of one density to that of another undergoes a change in direction; it is refracted, or turned aside (*frango*), from the position in which it has hitherto been travelling. M. Sondhaus has constructed a lens of thin membrane filled with carbonic acid gas, and by means of it has refracted sound rays to a focus.

A further point of similarity between the three motions—light, heat, and sound, is that they suffer *interference;* under certain conditions which we cannot discuss here, two light waves meeting in opposition produce darkness; two heat waves produce cold, and two sound waves, silence.

It is not alone simple vibratory motion which constitutes sound: the vibrations must attain a certain quickness before they impress us with the sense of sound: a pendulum vibrating backwards and forwards produces no sound, neither does the to and fro moving of our hand; but let a vibrating body attain a certain degree of quickness and sound is the result. When vibrations exceed a certain limit, a *musical note* is the result, and the difference between noise and music is this, that noise is produced by one blow being given to the ear as when a gun is fired, or by a series of irregular blows as when a cart is being dragged over a stony road, or by a succession of regular blows not exceeding 16 in a second; while a musical sound or note results from a number of regular blows or vibrations exceeding 16 in a second being communicated to the ear. The number of vibrations constituting any note may be determined by two different methods, that is to say by the Syren of Caignard de la Tour which we could scarcely understand without a woodcut, and by Savart's toothed wheel. The latter consists of a cogged wheel, to which rapid rotation can be given; suppose that the wheel possessed a hundred teeth, and that it revolves ten times a second, it is obvious that if a piece of card be pressed against the teeth of the wheel it will receive a thousand blows in a second, and communicate a thousand pulses per second to the ear: a greater velocity will produce a greater number of blows, a lesser velocity a smaller number in the same time. Now it is found that when the impulses are few in number the note produced is very bass, and that as the impulses increase in frequency the pitch of the note rises.

The lowest note which the ear can recognise as a distinct and continuous musical sound is produced by 16 blows or pulses, being communicated to the ear in one second; the highest note being 38,000, according to Helmholtz. Starting from 16 and multiplying continuously by two, we find that the ranges of the human ear is about 11 octaves. In music the extremes cannot be employed, and the practical range of musical sound is between 40 and 4000 vibrations in a second, that is in round numbers about 7 octaves. The deepest note of orchestral instruments is said to be the low E of the double bass produced by 41½ vibrations per second. Pianos and organs sometimes go as low as 27½ vibrations, and very large organs like those of Notre Dame of Paris and St. George's Hall, Liverpool, go down to 16½ vibrations per second. The highest note of all orchestra is the highest d of the piccolo flute, which is produced by 4752 vibrations per second. A grand piano may reach 4224. According to Savart, the lower A of the treble clef is produced by 440 vibrations in a second. But the note varies slightly in different orchestras and although many attempts have been made to obtain an uniform and precise pitch throughout Europe, the plan has not yet been carried out. Foreign singers constantly complain of our high concert pitch. Between the normal 440 vibrations per second, and the highest London concert pitch, there is a difference of 15 vibrations per second, and although this may seem slight out of 440, it in reality is very harassing to some singers, who of course have to raise all other notes in proportion. The same note has the following value in different cities: 440 vibrations per second, being the normal.

San Carlo Theatre Naples:	445
Opera Paris	448
Opera Berlin	448
Teatro della Scala, Milan	451
Italian Opera, London	452
Maximum, London	455

The range of the human voice has been stated to be between 43½ vibrations and 1392; but in 1770, Mozart heard La Bastardella in Parma close a cadenza with the C in altissimo of 2048 vibrations a second. The late Signor Lablache could easily sustain the low C of 64 vibrations.

The sensibility of the human ear is very great: a practised organist can distinguish the difference between 80 and 81 vibrations per second.

The finest effects both of the human voice, and of orchestras are often considerably marred by the building in which they are heard. This particularly applies to theatres, the side boxes of which do much obstruct the sound. Zamminer has compared them to gigantic traps for strangling sound. The theatre of Parma, which is celebrated for its acoustic properties, is we believe without stage boxes. According to Vitruvius, the Greeks placed brass bells over conical supports in niches at certain parts of their theatres, in order to increase the resonance; but it is difficult to see how they could have acted.

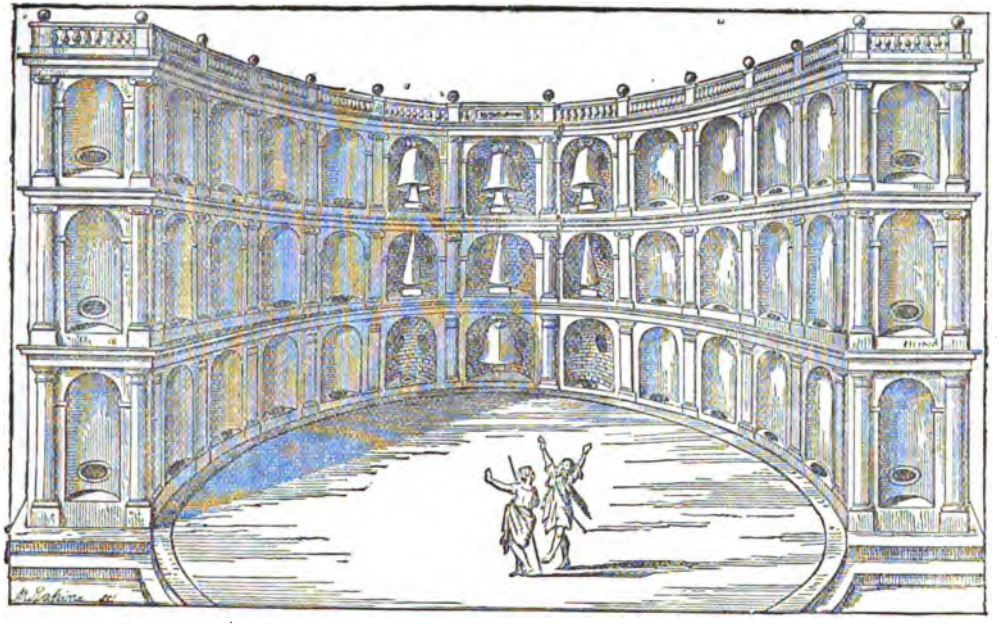

FIG. 4.—THEATRE OF VITRUVIUS.

PHYSICAL SECTION.—FRIDAY, MAY 28TH, 1875.

There were 28 persons present.

J. D. ROGERS read a paper on

THE BEARING OF SCIENTIFIC DISCOVERIES ON THE THEORY AND PRACTICE OF MUSIC.

THERE is nothing in the outer world which bears any actual resemblance to Sound and Light. There is a lot of mechanical movement, of rushing to and fro, of separation and junction of minute particles; but the distinctions which we call Light and Sound are unknown in the outer world.

Part of these movements are of such a kind that they only appeal to one sense: but the majority of them are either impalpable, or else appear to us as mere mechanical motion.

I shall first say a few words of those particular kind of movements which affect some particular organ of sense. They may, roughly speaking, be split up into two divisions: those which proceed in regular *waves*, and those whose character bears only an analogy to the movement of a wave. The former, when they are conveyed to us by means of a subtle impalpable fluid called Ether, strike against our eyes; then our eyes convey these motions to the brain, where they are, so to speak, changed into another language: they are no longer waves of ether but become Light. The latter are conveyed to us by means of air, but they can be propagated through solids and liquids equally well: the reason they come to us by means of air is merely due to the physical formation of the ear.

Let us first see what kind of movements air must assume in order to appeal to our organs of hearing.

Every sound-movement consists of two parts—a Condensation and a Rarefaction. At first a heap of air must be closely packed together, then a quantity of corresponding extent must be stretched out, loosely packed together. Let us see what we mean by "packed together" and "stretched out." Air is composed of a lot of particles. You may compare a line of air to a long row of marbles. Give one marble a push, then it will pass the push on to its neighbour. For half the row of marbles imagine that the marbles are each pushed nearer to one another than before—in fact imagine these tightly packed together: for the other half, imagine each marble to have a very elastic spring

so that after pushing against its neighbour it gives a jump back; plainly, then for this second half of the row the marbles will be farther apart from one another than they were at first: or in other words they will be extended or rarified.

I said this motion bore close analogy to the motion of a wave. Let us see what this analogy is.

Imagine an ordinary wave—say, a wave of the sea, or a wave of light, consisting of furrows and ridges at equal intervals. Then suppose a heavy plate is put at the top of these waves, and crushes them all into a single plane: then you will have, where the ridge was, a lot of water squashed into a narrower space, and packed very closely together; but where the furrow was, a very small portion of water will be left to fill a larger space, and the water will be loosely extended; or, scientifically speaking, you will first get a Condensation then a Rarefaction. And, just as a furrow and ridge made up a wave, so a Condensation and Rarefaction make up a vibration.

Indeed the analogy of the wave and vibration is so exact, that on the one hand people have got to talk of a vibration as a wave, to talk of sound waves just as they do of light-waves: and on the other hand, in drawing the shape of a vibration, they often draw it, for convenience sake, as a wave, leaving it to the imagination of the reader to imagine this wave squashed flat and to present differences of pressure to correspond to differences of wave-shape.

If in the course of this lecture I make use of these liberties, I beg you to bear in mind this one fact, that a wave of sound moves all in a plane, and that to get from an ordinary wave to a "sound wave" you must imagine a heavy level plate crushing the former into the latter.

I shall now try and show you how it is that these particular movements of either and air get construed into this strange language of Light and Sound. Let us imagine ourselves a vibration of sound, let us imagine ourselves enter the precincts of the ear, and see at what stage in our journey our form and character undergoes this extraordinary change.

We first travel along a narrow winding passage till at last further progress is stopped by a membrane which is stretched out from side to side and from top to bottom of the passage. We can get no further, but by bumping against this partition we can make our friends on the other side move on in a similar mode. Beyond the partition there is a hall, or apartment, called the drum or tympanum. When we once get inside it we find there are three ways out.

Firstly, a cavernous tube leads from the hall floor to the upper part of the throat. The use of this tube—the Eustachian tube as it is called—is to keep enough air in our hall so that the membranous partition may be kept well on the stretch, and so receive impressions from without, accurately. This road, then, does not lead us to our destination.

Secondly, up above us there is a chain consisting of three bones, the hammer, the anvil, and the stirrup; called so from their respective shapes. The handle of the hammer rests against the membranous partition by which we entered. The knob, which is some way above us, rests on the anvil, this again leads down to the stirrup, which is directly in front of us. The stirrup rests against an oval window, which has a stretched out membrane to serve instead of glass. This oval window opens into a hollow watery chamber divided into two compartments—called the Labyrinth. At the further end of it there is an immense quantity of stiff hairs and crystalline particles (called Otolithes). These are imbedded in the nerve which leads direct to the brain. Here we must pause. Here, it is, we undergo one metamorphosis—we are no longer moving particles but sound.

Thirdly, between the Eustachian tube and the oval window there is a round window, closed like the other window, by a stretched-out membrane. Let us suppose ourselves on the other side of it. We enter a narrow crooked tube, like a snail shell. This shell is divided into three parts; in the middle or upper compartment there is an instrument of 3000 keys, adjoining a branch of the nerve which leads to the brain. The furthest compartment is merely a passage leading to the Labyrinth. This middle part of the snail shell with its lute of 3000 strings is the most interesting to us. Here probably, the movement of the air like the moving fingers of the organist plays upon the keys and awakens the strange unknown phenomenon Sound.

In order then to get to the brain we may take one of two courses—we may either cross the bridge of bones, enter the Labyrinth, and strike against stiff hairs, and crystalline particles; or we may pass through the air into the snail shell, and when we get to the middle compartment play upon an organ of 3000 keys.

Music, however, essentially involves distinctions. How are we to apprehend distinction? How are we to distinguish between particular sounds.

Each particular sound sets in motion a particular hair or otolithe, or a particular string of the lute in the "snail shell." Each particular string, hair or particle has a particular nerve fibre attached to it, which carries its message to the brain, and no other messages.

We see the same phenomenon in the eye. A lot of rods are hung at the back of the eye, adjoining the fibres of the ocular nerve. Each rod has a particular nerve fibre to carry its particular messages to the brain. *

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* This theory is as yet only conjectured. But it is only fair to say that all Helmholtz's experiments and reasoning afford a great presumption of its truth.

But how is it that each rod or string is set in motion by a particular wave, and no other wave? Why is it not set going by other waves of sound, and so carry messages when it is not wanted to do so?

This seems a hard question to answer at first sight: but in reality the matter can be very easily explained by the elementary mechanical principle of sympathetic vibrations.

This principle may be explained as follows. When a series of waves strike against any chord either each successive wave reinforces its predecessor, and makes the chord vibrate more and more, till sound is produced: or it destroys and cancels its predecessor. Let us take a few illustrations of this. Give the pendulum a slight push: on its returning to its original position, give it another push—it will go farther than before, and if the push be repeated the moment the pendulum returns to its original position for several times the pendulum's swing will go on increasing. But if you push it the moment before or after one complete swing, your successive pushes instead of reinforcing, will cancel one another. Again, let a weak man pull at a strong bell. If he gives a pull at the rope immediately after the tongue of the bell has completed one swing; and give pull after pull at this exact moment, he will at last get the tongue to swing far enough to give a note. But if he does not exactly time his pulls by the swing of the bell, his successive pulls will spoil and annul one another, and no sound will be produced. It is the same with the ear. A series of waves of a given length strike against all the hairs and strings in our ear. In all, except one case, the successive impacts cancel one another. In the one exception, the vibration, awaken in the chord, has time to make exactly one or two or three journeys up to the top and down to the bottom of the chord: so that each wave hits the chord exactly at the end of its journey,—just as the hand hit the pendulum exactly at the end of its swing,— and so reinforces its predecessor to such an extent that sound is produced. To put this law of Sympathetic Vibrations into scientific language. Each wave has a particular period of recurrence: each string has a particular period, and when these two periods correspond, then they will set one another into vibrations or waves: when they do not correspond, the successive impacts cancel one another, and they cannot set one another into vibrations or waves.

It is thus, then, that each particular sound selects its particular string or hair: and that each particular hair and string sends its own peculiar message to the brain by means of a special servant (*i.e.*, nerve fibre)—where the brain puts its own odd interpretation on the movement, and construes it as sound.

Let us compare the process that goes on in the ear with that which goes on in the eye. Here there are a lot of rods or cones which have a particular vibratory period. They can only be set in motion by waves of ether which have a period exactly answering to the period of one of these rods. When the

rod is affected, it transmits its own particular message to the brain, by means of a nerve fibre specially attached to its service, and the Brain construes it in terms of Light. The method is similar. But the resources of either sense, and the interpreting power of the Brain differ.

These differences can be summed up into three heads.

1stly,—The ear has an immense advantage in compass It interprets as sound, waves varying from 16½ to 30,000 vibrations per second. That is to say the highest note it can hear is 11 octaves above the lowest note. Now the octave of a note means that note which travels twice as fast *it* does. Taking this meaning of "octave," the eye is only sensitive to one octave of vibrations: but where the eye fails, other senses step in and take its place: when the vibrations are too slow to affect the eye, they affect the sense of touch, and are construed into the language of hot and cold: when they are too fast to affect the eye they exert a chemical or actinic effect.

2ndly,—The ear exceeds the eye in its being able to resolve compound sensations into their constituent parts. "Every wave" according to Fourier's law, "can consist of several simple waves: one of which has its wave-leng h equal to that of the compound wave, while the rest are multiples of that wave." This law is applicable to Light-waves. The yellow light of the sun is merely a composite color, made up of red, yellow, green, blue, violet: the unaided eye cannot split up this compound color into its several parts: but by the aid of a prism you may see each separately.

And the law is equally applicable to "waves" of sound. On the back of the large wave creep smaller waves which are multiples of the larger one: and on these smaller ones, still smaller ones are borne and so on. Thus according to this rule, then, each sound we make is composite and can be resolved into a chief note, and several subsidiary ones. Now this is actually the case. When I strike C i on the piano, the following subsidiary notes are faintly sounded—C ii G ii C iii E iii G iii B♭ iii C iv D iv E iv—all these notes being multiples of the chief or fundamental note.* These upper notes, or as they are called Harmonic Overtones, are not, generally speaking, detected: they only add a fulness and richness to the fundamental.

There are two ways of hearing these overtones separately. Helmholtz has invented a lot of resonant balls: each resounds to some particular note and no other (by the principle of "Sympathetic Vibrations"): he holds each of these balls to his ear while a certain note is being sounded: the above mentioned notes resounded to C i, and thus, Fourier's Mathematical law is confirmed by Helmholtz's experimental observations.

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* C i has 64 vibrations per second: C ii 128: G ii 192: C iii 256: etc.

Secondly—by a less elaborate, and more popular way—raise the dampers (on the piano) of the six first Harmonic Overtones of Ci—by holding down these notes with your fingers, then strike Ci loudly; you will directly hear the chord of the notes held down, faintly, but audibly. Thus, then, the ear can split up a compound wave into his original elements. But this can be illustrated in another way, besides by hearing overtones. Let us strike two notes together, then add or subtract the vibrations per second of these two notes; if the sum or result coincide with the number of vibrations per second required to make some other note; this other note ought to be heard. These so-called Resultant Tones are seldom heard, as a matter of fact, because instruments are hardly ever in proper tune, only approximately so. Strike however Ciii and Eiii on the English concertina; and you will hear a faint Ci sounded. [C iii has 256, E iii 320 vibrations per second; subtracting these, the result is sixty-four per second, which is the period of Ci]. Ciii and G iii on the concertina will likewise enable us to hear C^{v} [here the periods are *added*.] This, then, is what we hear; but what, in the outer world, corresponds to these Resultant Tones? We may illustrate it from the pendulum. Strike it; then strike it, as it returns whence it set out, at right angles to its first direction; an intermediate course will be described. We can illustrate it more closely. Take two tuning forks in the relation of—say a fifth—to one another. At the top of each there is a mirror. Cast a beam on to mirror No. 1, off that on to mirror No. 2, off that on to a screen. Set both tuning forks going, with a fiddle-bow. Then the course of these two notes, added together, will be marked out on the screen. In the same way we are enabled to see any chord and hear it at the same time. So the ear is superior to the eye, in being able under certain conditions to break up a compound wave into its component parts. It has yet another advantage.

3rdly—A "residual sensation" lasts longer with the eye than with the ear. An instance of this will show you what I mean. A moderate light presented to the eye, leaves an impression on the retina $\frac{1}{4}$ second, after its withdrawal. A bright cloud, presented to the eye for $\frac{1}{4}$ second, remains on the retina twelve seconds after it is removed. Further, red, which has the longest wave, remains longer than any other colour. In the same way yellow lasts longer than green, green than blue, blue than violet. In acoustics the low C is heard $\frac{1}{8}\frac{1}{6}$ second after the "waves" cease. The faster the waves of a particular note go, the less time does the residual sensation last, till we come to the high C, which only leaves an impression lasting $\frac{1}{1}\frac{1}{0}\frac{1}{0}$ seconds after it stops sounding.

The way this was found out is as follows:—A tuning fork was made to vibrate between a cardboard and a resonant ball. The latter was closely applied to the ear of the experimenter. The former was pierced at regular

intervals, with holes which fitted the end of the tuning fork. When the tuning fork was made to vibrate, and the cardboard was turned round, the cardboard first cut off all sound, then the hole in the cardboard admitted sound. The periods of loudness and silence were made equal. The cardboard was made to revolve at a measurable rate. When it was made to revolve at such a rate, that the silent interval was reduced to $\frac{1}{30}$ second, and when a Ci tuning fork was vibrating, the silent interval was swallowed up in an un-interrupted murmur. The same experiment was tried by Mr. Mayer, for nearly every note in succession. The following diagram represents his conclusions. The curve refers the particular note to the time its residual sensation lasts; the dotted line is an imaginary one, drawn on the hypothesis, that the time of the residual sensation is in inverse proportion to the number of vibrations a note has per second.

The superiority of the ear over the eye in this respect is a sign that the ear is much quicker in receiving new impressions, it can discriminate sounds with greater rapidity.

If the ear is the quicker instrument, the eye is more accurate.

By the method of the tuning forks and mirrors, already described, we are able to see chords. Often chords which *sound* in unison, *look* out of tune, thus the eye is able to detect defects with greater accuracy than the ear. This one advantage the eye has, to set off against the three advantages of compass, analytical power and quickness which the ear possesses.

We have, now, seen how a sound is conveyed to the ear, how it is interpreted as sound, how, too, particular sounds are distinguished from other sounds, with what degree of power and accuracy—let us now see in what these differences mainly consist, what different classes of sounds the ear is called on to discriminate.

The great distinction which underlies all others is that between music and noise. The former gives pleasure, the latter pain. Let us examine the physical conditions which constitute the difference between noise and music.

1.—Firstly as to the succession of separate sounds. A musical note must be prolonged sufficiently long for us to gain some definite conception of it. If one note is struck only to be replaced by another before we have apprehended it: if, that is to say, waves of dissimilar length follow one another with a certain degree of rapidity: Noise and not music is the result. Music, on the other hand, implies that waves of equal length succeed one another long enough for us to gain a clear conception of the particular note sounded. Noise is confused, undistinguishable. The fundamental character of musical notes * is distinctiveness. What then, are those distinctions which make up musical notes?

* In I Cor. xiv. 7, we have this scientific fact hit at, "pipe or harp, except they give *distinction* in the sounds, how shall it be known what is piped or harped?"

They are threefold; loudness, pitch, quality or timbre. What do we mean by *loudness*? In showing you what sound was I told you that a line of air was made up of a lot of particles all in a row: and I compared them to marbles. Each marble when pushed goes a little way, hits its neighbour and falls back to somewhere near where it was before. Similarly each particle of air makes a little excursion forward and then falls back. The length of this excursion is called, in science, the amplitude. Loudness varies with the square of the "amplitude of vibration." *Pitch* is the second distinction. Pitch is dependent on pace. The faster the pitch the higher the note and *vice versa*. When less than 16½ waves succeed one another in a second, the ear cannot be affected by them. The lowest C on the piano has 32 vibrations per second. The pace of sound varies with the temperature, etc., but if it is 1120 feet per second, and 32 vibrations succeed one another in a second, the "wave" length is 35 feet. The next C above that has 64 vibrations in a second, and if the air is in the same condition as before, its wave will measure 17½ feet from one end to the other. Thus it is that we can determine the normal length and period of any note on the piano. We are accustomed to take the piano as our standard of pitch but it is a very false standard. In the piano one note has to do for the fundamental of one scale, 2nd of another, 3rd of another, and so on. Now there is a different interval between the 1st and 2nd, 2nd and third, etc., so that if one scale is in tune, the other scales are out of tune. In consequence of this a compromise is effected. No scales are exactly in tune: all are a little out of tune. Here is a typical specimen.

	As it ought to be.		As it is.
C	258·7		258·7
D	291·0		290 3
E	323·4		325·9
F	344·9		345·3
G	388·0		387·6
A	431·1		435·0
B	485·0		488·2
C	517·3	(vibrations per second)	517·3

Lastly we come to *timbre*. By timbre we mean the quality of a sound, the sound-tint as Tyndall calls it: that which distinguishes a note on the organ from the same note on the piano, or the fiddle, or the concertina. We have already seen that it cannot be due to the size pace or particles of the wave: there is only one alternative left: it must be due to its shape.

Of two waves we approximately know the shape, that of the tuning-fork, where the furrows and ridges are perfectly smooth and similar, the latter fitting into the former exactly: and that of a string struck by a plectrum or quill which takes the following series of shapes.

[N.B.—We are compelled to *draw* the wave as though it consisted of ridges and hollows: of course a sound wave is never really so: you must imagine, as I said before, a level plate crushing these waves into a single plane, so that differences of shape will merely come out as different distributions of pressure].

The difference of timbre, then, is due to difference of wave-shape. But this difference of wave-shape is no more nor less than difference of Harmonic Overtones. If one wave differs from another in shape, it is because it has a different set of small waves on its back: and these small waves, as we saw before, are merely overtones.

So that difference of shape =difference of timbre=difference of overtones. We have illustrated the identity of the first 2 and last 2: let us now illustrate the identity of the first and last.

In an organ on the middle row of keys, let us open the diapason stop, and note well the timbre of, say, the chord of C. Let us then pull out the principal, twelfth, and fifteenth, which merely imply the same note struck an octave, twelfth and fifteenth higher, in fact are mere artificial overtones; then strike the same chord. The timbre is quite changed. We cannot have a simpler and more decisive instance than this, of the fact that difference of timbre means difference of overtones.

We can carry the proof of this a step farther. Difference of pronunciation means merely a sort of difference of timbre. Well, Helmholtz has proved by his "resonant balls" that the following German vowels have their overtones close to the following notes.

2.—We have hitherto been regarding the difference of musical and "Noisy" notes, now let us regard the mutual relation of notes simultaneously sounded.

Noise is merely an aggravation of discord. Discords are only used in music under very strict reservations, despite Mr. Brahm. When discords are used with any regard to these reservations, music becomes noise.

What is the physical distinction between discord and concord?

A discord is defined as a combination of notes which produces audible Beats. A beat is a jarring sound produced by an alternate increase and decrease of sound. The physical cause is as follows. Let two waves of nearly equal length start off in the same direction. At the starting point the condensation of one will all but coincide with that of the other. Hence a very loud sound will be produced. After say 25 waves the wave of one will have lagged half a wave length behind its comrade: and the rarefaction of one will all but coincide with the condensation of the other; they will cancel one another, and silence will result. After 50 wave-lengths double the natural loudness will be produced and so on. Let us suppose for simplicity's sake that 1100 of these waves are travelling in a second. Then in one second there will be 22

alterations from great loudness to complete silence, in the musical linguo there will be 22 beats. In consequence of this these two notes will be discordant. There are two considerations to be taken into account with reference to Beats.

1.—The beats must be audible. To find out how many beats must succeed one another in a second so as to blend into a continuous murmur, we must take the note into consideration. This is dependant on the duration of the residual sensation for each note, which we have already illustrated (vide the curve supra). In accordance with this, the following table represents the nearest notes to particular notes, which can be used with them, without causing audible beats.

C^1 of 64 vibrations per second	...	=fourth + $\frac{3}{4}$ semitone.
C^2 of 128 vibrations per second	...	=fourth + $\frac{2}{9}$ semitone.
C^3 of 256 vibrations per second	...	=major third + $\frac{4}{7}$ semitone.
C^4 of 512 vibrations per second	...	=major third + $\frac{1}{24}$ semitone.
C^5 of 1024 vibrations per second	...	=minor third + $\frac{3}{10}$ semitone.
C^6 of 2048 vibrations per second	...	=one tone + $\frac{1}{15}$ semitone.

This shows us that the best part of the scale for expression is the middle, as when you get very low nearly every combination is a discord, and when you get too high hardly any combination is a discord.

2.—The beats of Harmonic overtones and Resultant tones must be taken into account.

In harmony or the grammar of music, the fifth is only used under certain reservations. This must be, if the rule is not arbitrary and unreasonable, because the fifth involves a discord. But the notes are too far apart to produce beats. Let us see if any beats are not caused by the overtones. The fifth stands to its fundamental in the ratio of three to two; the first overtone, or multiple of the former will coincide with the second of the latter. But the chord of the fifth is never exactly in tune on the piano, organ, harmonium, etc.; consequently the overtones will very nearly, but not quite coincide; and because of this, beats will be produced in accordance with the phenomenon explained above.

These are the two physical differences between noise and music. There may possibly be yet another difference. We saw that there were two roads from the tympanum to the brain, one by the snail shell, the other by the labyrinth. The former was reached by air, the latter by a bony bridge.

It is conjectured that noise addresses itself solely to the latter, music to the former. At any rate, music is propagated through air with greater accuracy than through solids; and ordinary sound travels through solids with greater facility and rapidity than through gases. Add to this, the rough hairs and crystalline particles seem much more appropriate for undistinguishable noise; whereas the Æolian harp played on by the air of

the tympanum, seems more appropriate for the subtle distinctions of music. This, however, must remain for at present a matter of conjecture.

There is a further distinction between noise and music, which concerns the laws of our mental being. Noise pleases, and music displeases. The cause of this was agitated not long ago by German, then English philosophers. The answer arrived at, in accordance with a theory, I will proceed to explain to you, tallies so exactly with the scientific and physical side of the question, that great presumption is afforded of its truth. The theory is this, music originates with singing. Vocal music is only emotional language carried a step farther. This accounts for, firstly, the nature of music; secondly, the pleasure it affords. (1) emotional language is distinguished from ordinary talk by the introduction of alien elements, timbre, pitch, loudness, and also by its greater resonance, *i.e.*, the note is now sustained and continuous. These are the exact differences, which science proves to characterise music from sound. The distinctions of emotional language are less definitively marked than those of music; emotional language is a sort of half-way house between common talk and vocal music, it served to suggest the idea, not to complete the invention of music. Doubtless the whole source of music like that of language is partly from within, partly from without. Imitation of nature fills in the picture, of which personal instinct sketched the outlines. (2) This theory accounts for the pleasure which music inspires. Music is an extension of emotional talk. This extension was made consciously or unconsciously. Doubtless the origin of music was soon forgotten; but because this course was traced by history, an unconscious chain-work of ideas lurked in the mind. It was formed of three links—emotion, emotional talk, music; the middle link was forgotten: but when one end of the chain was pulled the other was set a-going. In a word, an indissoluble connection was formed between emotion and music. And because its definite formation fell into forgetfulness, that vague dreamy sense of unaccountable pleasure is produced by music.

This is only theory, but the recent discoveries in the Physical World, in addition to the usual observations of barbaric society, afford strange confirmation of it.

Now we have come sufficiently far to appreciate the bearing of scientific discoveries on the theory of music. Science corrects the observations of one sense, or the blind guesses of the mind at truths, by the combined results of knowledge, based on all our senses, of knowledge gained at first hand from nature. The musical laws of discord, the musical selection of pitch, were so many blind guesses at truth; they were entirely empirical, based as they were on very limited observations, the crude cravings of the mind. Science proves that these blind guesses and mental bents from which they arose, are true and not arbitrary: are part of the great order of things, not casual,

haphazard desires. Science has found little to correct, it invents no new tunes, it reveals no new strokes of art, it merely verifies that which men have found out and acted on for centuries and centuries. Science elevates music and musical ideas to the region of facts; it links them on to the Eternal Kosmos; it places music on the indisputable basis of truth.

THE SPECTRA OF POLARIZED LIGHT.

BY A. E. GARROD.

I PROPOSE to lay before you in an abridged form the results of the various experiments which have been tried from time to time in connection with the interference Spectra of Polarized Light. I believe that Fizeau and Foucoult, two celebrated French physicists, were the first who entered upon this field of enquiry. The subject has since then been thoughly treated by Mr. Spottiswoode, and he was enabled by means of his very fine pair of Nicol's prisms, to shew all his effects to an audience, in the lecture-theatre of the Royal Institution.

The question to be solved by these experiments was the following—what is the nature of the colours shewn when a beam of polarized light passes through such a crystal as selenite. Now we know that the selenite colours are due to interference, and hence we should suppose, that the colours are owing to the presence of bands, resembling the absorption bands of blood, and that they are not monochromatic—this is found to be the case on taking a very thin plate of selenite such as shews the colours, blue and yellow, (or rather brown); we find a single black band in the spectrum, due to the extinction in the case of the blue, of all the yellow light, and in the case of the yellow of all the blue light; but we know that if the selenite shews its fullest colour, on rotating one of the Nicol's prisms through an angle of 45° all colour disappears, and at 90° the complimentary colour is most vivid, so in the spectrum the band disappears at 45°, and reappears in the complimentary part of the spectrum at 90°. Further, as the breadth of the plate is increased, one of the rays is retarded more and more behind the other, and consequently colours of greater and greater wave length interfere. The spectroscope confirms this for as the thickness of the selenite is increased the black band moves along the spectrum from the red to the violet end, and when a certain thickness is reached, it happens that two sets of waves are in a condition to

interfere, the one ray lagging an odd number of half wave-lengths behind the other, and a second band appears, which also moves along until a third is added, and by increasing the thickness to an indefinite extent the number of bands is also increased indefinitely. Now it is obvious that when there are two bands in the spectrum the tints will be different from those due to a single band, and the selenite green and red, are produced by such a spectrum. We have thus accounted for the blue and yellow, and the green and red, of selenite plates, but we know that the green and red varies in intensity being in some cases very vivid, while in others they are quite pale, the latter is due to the presence of three black bands in the spectrum, and when a greater number is present, the colours are so faint as to be hardly perceptible. This is owing to the fact that the light is taken from a greater number of parts in the spectrum, and whereas a single thick black band destroys the equilibrium of white light, a number of bands thus distributed through the spectrum, hardly destroys that equilibrium at all, and it is obvious, that the light will become more nearly white, as more and more bands are added, so that the light transmitted by a plate shewing 20 bands, is much whiter than that from a four or six band plate. The light however may be said to be practically white from any plate shewing more than 4 bands. Perhaps this would be rendered plainer by an analogy; if three heaps of sulphur be taken, and three of nitre, and three of charcoal, in the proportion in which they produce gunpowder, and one heap of each be taken and mixed, the result may be proved to be gunpowder by the fact of its burning and odour, but if from another set of heaps one of the constituents, sulphur for example, be removed, a mixture of the remaining two will not be gunpowder.

Now this resembles our banded spectrum, just as the removal of one of the constituents destroys the gunpowder, so the removal of one of the constituent lights destroys the white light.

But if from the third set of heaps we remove, half the nitre, half the sulphur, and half the charcoal, we have on mixing the remainder, gunpowder indeed, but only half the quantity which we should otherwise have had. Here again the analogy is complete: if I cut off the same fraction of all the constituents of white light, I have a less quantity of light in the end but it is still white.

The number of bands in the spectrum is directly proportional to the thickness of the selenite plate, that is to say if you double the thickness of the plate you double the number of the bands, if a plate $\frac{1}{170}$ of an inch thick shows two bands, a plate $\frac{1}{170}$ of an inch thick will show four bands. This is found to be the case by measuring the plates with a micrometer screw.

Appended is a table of results, and although the results do not exactly correspond with the theoretical computations, the inaccuracy is probably due to the fact that the point of the screw perforates some plates more than others,

and that the thoretical thicknesses are all deduced from the measured thickness of a single band plate which may not have been perfectly accurate.

Colour shewn.	Number of band.	Measured thickness.	Calculated thickness.
Blue and yellow...	1.	$\frac{1}{30}$ inch.	$\frac{1}{30}$ inch. (taken as units.)
Green and Red ...	2.	$\frac{1}{14\frac{1}{2}}$ inch.	$\frac{1}{15}$ inch.
No tint perceptible	4.	$\frac{1}{7\frac{1}{2}}$ inch.	$\frac{1}{7\frac{1}{2}}$ inch.
„	6.	$\frac{1}{5\frac{1}{2}}$ inch.	$\frac{1}{5\frac{1}{2}}$ inch.
„	10.	— inch.	$\frac{1}{3\frac{1}{2}}$ inch.

The breadth of the black bands increases inversely as their number, that is to say that the bands of a six band plate are each half the breadth of those of 3 band plate.

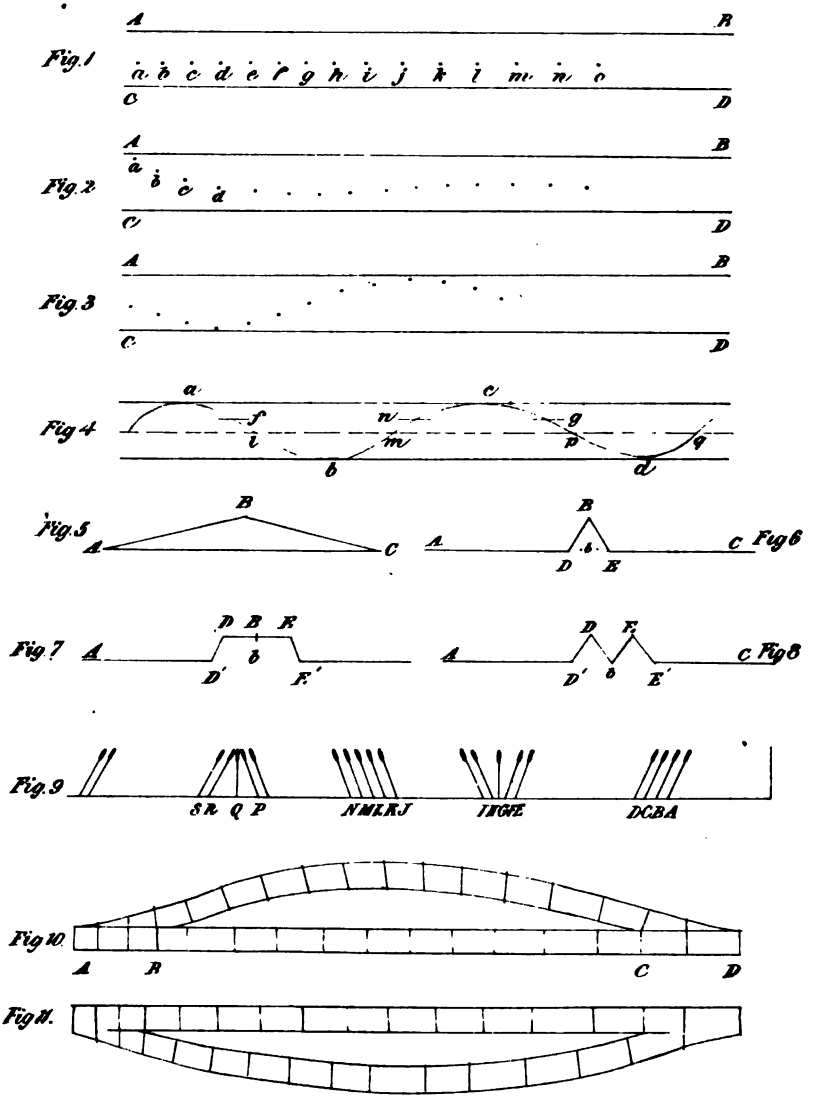
From this it follows that whatever be the thickness, polarized light which has passed through a selenite plate, has its light diminished by a definite amount; for if one of the bands of a double-band plate is half the band of a single-band plate, the two together must equal in breadth the band of the single-band plate, and in the same way the twenty-bands of a twenty-band plate equal the band of a single-band plate; by making accurate drawing with a camera lucida this law of the breadth of the bands is found to be correct.

The intensity of the bands also decreases as their number increases. When examined with an ordinary spectroscope, these bands do not seem to be evenly distributed, owing to the irrationality of dispersion, appearing to increase in distance from each other, from the red to the violet end.

Thanks to Mr. Harding, I am able to lay before you a satisfactory explanation of this decrease of the thickness of the bands.

It seems incorrect to talk of the bands having any thickness at all if we consider their origin, for it is evident that total extinction only takes place in a mathematical line because only in one line is it that the one wave is exactly half a wave length behind the other; but, just by, there are on each side waves in which these conditions are very nearly fulfilled, and the extinction is accordingly very nearly complete, the deviation from the conditions of total extinction decreases gradually on each side of the line, and the line ought therefore to shade off imperceptibly from intense black in the centre to the ordinary light of the spectrum. How then can we distinguish where they end and where they begin. Now the eye is an extremely bad judge of differences of intensity, for instance, it cannot distinguish the difference in the intensity of the light at the centre and edge of the moon, and as the darkness of the bands gradually increase, it is not conscious of the fact, until at a certain point, it suddenly becomes so, and realizes that it has become dark; this point then is what we have called the limit of the black band.

H.D. Drury, Esq. on "Wave Motion."



Moreover it is evident that if we have two spectra of the same length, and in the one we have three evenly distributed lines (as they would be in a diffraction spectrum), and in the other six, the space between two lines in the latter case will be half the space between two lines in the three band spectrum, and whereas between each pair we have waves getting more and more out of the conditions of interference until they reach a point where one is an even number of half wave lengths behind the other, and the intensity is increased, and then, waves on the other side of that line approaching more and more nearly to the conditions of extinction; these changes will have to be gone through in the case of the six-band plate in half the space which they occupied in the three band plate, what then will be the result; the shading off from the line of total extinction will be much less gradual, and the distance between the line where we realize the change from light to darkness, and the line of total extinction, will be half the corresponding distance in a three band plate, and as this will take place on each side of the line of total extinction, the appearance will be that of a band half the thickness of the band of a three band plate.

We have seen that the parts occupied by the dark bands in the spectrum, and also those occupied by the spaces half way between them, become on rotating the Nicol alternately light and dark: they are therefore plane polarized, but this is not the case with the parts half way between these two positions, for they remain permanently bright.

What condition therefore is this light in? It is evident that it must either be circularly polarized or not polarized at all; in either of these conditions it would suffer no extinction. How then can we distinguish between circularly polarized, and unpolarized lights?

There is an instrument called the quarter-wave-plate, to describe the principle of which would be wandering too far from my subject, suffice it to say that it has the power of converting circular into plane polarized light and also plane into circular; if therefore the intermediate spaces are not polarized at all, on introducing such a plate the plane polarized light of the bands and the spaces they would occupy on rotating the Nicol, will be rendered circularly polarized, and will therefore be no longer extinguished, and the intervening spaces will be unaffected and a continuous spectrum will be obtained, interference being impossible. If there be in the plate what in geological language is termed a "fault" in the selenite plate, that is to say a sudden increase in thickness, a breaking of the band will take place owing to the different positions of the bands, in the different thicknesses of the plate, in a wedge shaped plate the lines lie diagonally.

I will now pass on to the effects produced by the superposition of two selenite plates; if they are layed in the position which they would occupy if forming a single crystal, they present the appearance of a plate shewing a

number of bands equal to the sum of the number of bands of the two plates, but on rotating one of them through 45°, a single band will be seen at a particular position in the spectrum, this breaks into two which recede from one another towards the red and violet, being followed by other pairs which advance to meet one another according to the position in which the Nicol is rotated.

The bands do not however have the same intensity throughout their course, as the presence of a single band destroys the equilibrium of white light, and as the superposition of plates produces single bands, the equilibrium of white light is destroyed by a number of superposed plates which produce no colour individually; the colour is brighter the nearer the numbers of bands in the two or more plates approach equality, brightest when quite equal.

It is interesting to trace the effects when a three and six band plate are superposed, the effect equals chromatically that of a three band plate; on starting the spectrum shows nine bands, then they approach each other three pairs, and soon a shaded space is seen between each pair, and then the bands composing a pair combine and the result is a spectrum showing three bands.

I must conclude by returning my thanks to Mr. Harding and Mr. Rodwell for the help which they have afforded me in the preparation of this paper, and especially for Mr. Harding's explanation of the decrease of the breadth of the bands.

MEETING HELD JULY 15TH, 1875.

A paper was read by H. D. DRURY, ESQ., on

WAVE-MOTION.

I THOUGHT it would not be amiss if to-night I read you a short paper on Wave-Motion.

To study Wave-Motion in its full extent, would be almost to go over the whole range of physics; it would involve the whole of the sciences of Light and Sound, nearly the whole of Heat, and very probably the science of Electricity. When I speak then of giving you a paper on Wave-Motion, I do not mean that I am going to give you an exhaustive treatise on physics generally; but just as one might give a lecture on the "syllogism," or the art of reasoning, without examining every syllogism or every branch of reasoning, so I thought it might be possible to bring together in a connected

form the common characteristics of all Wave-Motions, dwelling especially on those characters of the motion, which are alike for all, whether the motion be that of the waves of the sea, or the waves of light or sound.

Now, if I were to begin my paper with some hard scientific definition of what Wave-Motion is, I would probably puzzle many of you, and thereby lose your attention. I will rather bring before you some every-day examples of the motion, and so perhaps from the study of these particulars you may be able to appreciate the general conception conveyed by the term Wave-Motion.

Imagine a number of particles arranged in a straight line, as in (Fig. 1.) and let us call them—*a*, *b*, *c*, *d*, &c., and imagine them so connected that if we disturb any one, say, *c*, from its position of rest, we disturb its right-hand neighbour, *d*, and therefore *e*, and therefore *f*, and so on through the whole row. And suppose there to be drawn above and below the line of the particles two lines *AB*, *CD*, parallel to the row, and suppose it is possible for each particle when disturbed to bob up and down between these two lines, and that it is only possible for them to move in this way. Each particle as it is at present, is at rest, and is said to occupy its mean position, or position of rest, and the line of particles is called the line of mean position, just as *AB* might be called the line of highest, and *CD* the line of lowest disturbance.

Now suppose we disturb *a*, from its position of rest, and cause it to oscillate up and down between the lines *AB*, *CD*; almost immediately after, *b* will begin to move, but will be a little behind *a*, so that when *a* reaches the line *AB*, *b* will not have quite reached it; and in just the same way *c* will be behind *b*, and *d* behind *c*, and finally we shall come to the particles which have as yet not been disturbed, and the particles will present this appearance. (Fig. 2.) As soon as *a* has reached the top line it will begin to descend, *b* will now reach the top, *c* will be a little behind, and the rest just as before, except that more particles will partake of the motion; your eye can easily picture what the state of affairs will be.

In a short time, *a* will have travelled down to *CD*, and back to its position of rest, and suppose it to remain there; *b*, will be slightly below the line of mean position *c* still further below; and the particles will be arranged as in the Fig. 3.

If we make no further disturbance, each particle will come up one by one to its original position, and remain there, each particle having traversed once up and once down between the lines *AB*, *CD*, and this wavy appearance will travel through the entire length of the particles, and will in time pass over them all; the particles will now be left in exactly the same position as when first we disturbed *a*; but as soon as *a* reaches its position of rest, suppose we give it the same motion as before, we will thus create a second wavy appearance, following in the wake of the first; and suppose we continue

in this way to disturb a, when it is on the point each time of coming to rest; is it not evident that we shall have the whole row of particles arranged in this manner. (Fig. 4.)

Before we can proceed any further with our subject, we must become familiar with certain terms, and first let us take the term *amplitude*; by the *amplitude of vibration* is meant the distance each particle describes from the moment it leaves its position of rest till the time it comes back to it; so that looking at any one of the preceding figures, the amplitude of vibration for any one of the particles is twice the distance between the lines AB and CD; for consider the motion of one of them during its period of oscillation, it passes first to the top line, then falling, it passes through its position of rest to the bottom line, and then rising, it comes finally to rest at the middle line; so during this time it has travelled twice the distance between the lines AB, CD; and the time occupied by this journey, is what is called the *time of vibration* of a single particle. Now if you look back to figure 3, you will see that during the time the particle a was performing its oscillation, the motion had spread itself as far as the particle w. And you will see that the particles included between these two, a and w are in all states of vibration, those near a just ceasing to vibrate, those further off, either just leaving or approaching the lower line, and so on till, as we approach w, we come to a set of particles just beginning their vibrations; now such a collection is called a *Wave*, and by the length of the wave is meant the distance between the two extreme particles a and w.

Picture to yourselves such a succession of waves as is represented in figure 4. You see that each wave has a front and a back, and that while the particles in the front are rising, those in the back are falling, and if you compare one wave with another, you will find that the particles which constitute the two waves will go in pairs, *i.e.*, to each particle of the one wave will correspond a particle in the other; the two particles will leave their positions of rest at the same moment, will reach the top line at the same moment, in fact the motions of the two will be identical throughout the period of oscillation. Two such particles are said to be in the same phase; thus in figure 4, the two particles f and g are in the same phase, for they are both rising, and are both at the same height above the line of mean position, but h and g would not be in the same phase, for though they are at the same height, the one is rising while the other is falling. Observe also that in the same wave no two particles are in the same phase, a wave is a collection of particles, which are in all possible phases, but with no phase repeated.

Figure 3 describes the appearance of the particles at the moment when a comes back to its position of rest, you see that the disturbance which

began with a, has spread itself as far as w, and the interval between the two is the length of the wave. Now how long has it taken the wave to travel its own length, the exact time that it took the particle a to oscillate once up and once down between the two lines AB, CD, and this time is the time of vibration of each of the individual particles; this fact will lead us to a simple and very important formula connecting the *length of the wave*, the *velocity of the wave*, and the *time of vibration* of the particles.

Suppose a man were walking at a uniform rate of a certain number of miles per hour, you would get the distance he walked in any interval of time by simply multiplying his rate per hour by the number of hours he was walking, and so it is exactly with the wave. Call the rate or velocity of the wave, V, meaning thereby that V denotes the distance which the wave can travel in a given time, say one second; then if it takes a particle t seconds to make a complete vibration, the wave during that time t, has travelled a distance $= V \times t$ but the distance travelled by the wave during the time of vibration is the length of the wave, therefore length of wave = (velocity of wave) $\times$ time of vibration.

See how such a formula would enable us to solve a problem like this. A person is out at sea and wishes to find the rate at which the waves are travelling, how would he find it? Suppose he could put up two posts in the direction in which the waves are travelling, and suppose the posts to be separated by a known interval, say one mile; then let him select a particular wave and see what time it took the wave to travel from post to post. Then I say if he could do all this, he would have sufficient data to determine the velocity of the waves. But it would be utterly impossible to put up two fixed posts in the ocean; and if you consider for a moment you will see that it is not at all necessary; for you will see from the formula

$$l = v\,t$$

that if we could ascertain any two of the three quantities we can find the third. Now the length of the wave could be easily observed, a good judge of distance would tell to a foot the distance between the crests of two waves, and the time of vibration might be easily observed by marking any object on a wave such as a piece of cork, or a sea-gull, and noting by your watch how many seconds it took in rising and sinking alternately to the top and bottom of the wave. Suppose, for the sake of illustration, that the distance between the crests of two consecutive waves is 30 feet and that the time of vibration is 2 seconds, then if V be the velocity of the wave

$$V = \tfrac{30}{2} \text{ feet}$$

i.e., 15 feet per second,

which would make the velocity of the wave between 10 and 11 miles per hour.

Let us consider how such a motion as we have been describing differs from any other motion, the motion for example of a cricket ball when it is thrown from one person to another. In this case you are sensible that a material something has passed from one person to the other, the cricket-ball leaves the hand of the thrower and a few seconds afterwards is in the hands of the catcher; such a motion as the ball possesses is called a *motion of translation*; it is the kind of motion that we have most frequently presented to our view. But how very different is this motion to a wave-motion! in the latter you are sensible that nothing material passes from one place to another, and yet that something does.

Stand upon the sea-shore and observe the advancing rollers before they are distorted by the friction of the bottom. Wave after wave is seen to approach and at last break upon the shore, but that ridge of water which you saw far out at sea and which you followed with your eye the whole way to shore is not the same ridge which is now breaking at your feet; the former ridge came to rest, but in doing so it forced up another exterior to it, and this in subsiding another and so on. A stretched string is another good illustration, any disturbance given to the string at one end is propagated by the string and a tremor is seen to run along the string. In both cases one thing cannot fail to strike you, that which advances on the surface of the water—the sinuosity which runs along the stretched cord—are neither of them *things* but *forms*. They are not moving masses advancing in the direction in which they appear to run, but outlines or figures, which at each instant of time include all the particles of the water or the cord, which it is true are moving, but whose motion is in fact transverse to the direction in which the waves advance.

We may generalize this idea of a wave and conceive it as the propagation in a definite direction of a relative shape of particles which are themselves oscillating about their positions of rest.

But a person might very naturally say that this theory of wave-motion is built on a hypothesis, the truth of which is by no means evident. We began by assuming a row of particles so connected that any motion given to one is imparted to the next, and then to the next and so on, and that each particle only travels a short distance backwards and forwards about its mean position, and having moved once forward and once backward comes to rest.

I think the illustration of the stretched string will shew the reasonableness of the hypothesis. Conceive a blow given to a point in the middle of the cord transversely to its length. The point to which the blow is given will be thrown out of the straight line, and a flexure, or angle, will be formed in that part. Owing, however, to the inertia of the cord the displacement of the particles in the first instant will be confined to the immediate neighbourhood of

the point of impulse; so that the cord will not at once assume the state represented in figure 5, consisting of two straight lines AB,BC forming a very obtuse angle ABC, but rather that shown in figure 6, in which the greater part on either side AD, EC, retain their original position; and a small part *DBE* proportioned to the violence and suddenness of the blow is as it were bulged out into an angular form DBE. The particle at B then is solicited on both sides by the tension in the cord in directions B,D, B.E; but these tensions which in the quiescent state of the string exactly counteracted each other, now only do so in respect of those parts of each which when resolved act in directions parrallel to DA, EC respectively. The other resolved portions perpendicular to these, conspire and urge the point B towards its point of departure b. As there is no force to counteract this (the impulse being supposed momentary) B will obey their solicitation and approach b with an accelerated velocity.

But action and re-action being equal and contrary, the same force by which the molecule E drags B down, will be exerted on E to drag it up or out of the line. So that by the time B has performed half its course towards B, E will have been raised above the line, and will have acquired a velocity capable of carrying it still further in that direction. At this instant the cord will have assumed the figure 7. AD'DBEE'C.

At the next moment the forces are reversed, *B* then drags both *D* and *E* down to the line; but its own acquired momentum is expended in the effort, and by the time it has reached its original place on the line, its inertia is destroyed, and it rests there without a tendency to go beyond it on the other side. Meanwhile, however, *D* and *E* have attained their highest elevation; and thus the protuberance *DBE* is resolved into two *D'DB*, and *BEE'* (of less height however) on either side. (Fig 8.)

In like manner the particles *D* and *E*, in returning to their places drag up the next adjoining *D'* and *E'* and then the next and so on; and thus the summits of the protuberances advances along the line, and correspond in succession to all its points; and the visible effect is an undulation or wave, which runs along the cord with a velocity, greater the greater is the force with which the cord is strained, as it manifestly ought to be, since the rapidity with which each molecule returns from its displaced situation is greater as the force urging it is so; and this force is nothing more than the resolved part of the tension.

The waves in a field of standing corn, as a gust of wind passes over it, afford a familiar example of the relation between the motion of the wave, and that of the particles of the waving body comprised within its limits, and of the mutual independence which may in certain cases subsist between these two motions. The gust in its progress depresses each ear, in its own

direction, which so soon as the pressure is removed, not only returns by its elasticity to its original upright situation, but by the impetus it has thus acquired surpasses it and bends over as much, or nearly as much on the other side; and so on alternately, oscillating backwards and forwards in equal times, but continually through less and less spaces till it is reduced to rest by the resistance of the air. Such is the motion of each individual ear; and as the wind passes over all of them in succession and bends each equally, all their motions are so far similar. But they differ in this, that they commence not at once, but successively.

Suppose (to fix our ideas), the wind runs over 100 feet in a second, and that the ears stand one foot asunder, and each makes one complete vibration to and fro in a second. (Fig 9.) Suppose *A* to be the furthest point which the wind at any given instant of time has reached, or the last ear which it has just bent, and let the action of the wind be regarded as lasting only for a single instant. Then will the next preceding ear *B* have already begun to rise from its bent position, the next *C* will have risen rather more, and the 25th ear *G* (since the distance *A F* is 25 feet, and consequently since $\frac{25}{100} = \frac{1}{4}$ of a second has elapsed since the wind was at *G*), will have gone through one fourth of its complete vibration to and fro, and will have therefore just attained its upright position; so that the ears *F E* immediately adjacent towards *A* will not yet have quite recovered their perpendicularity but still lean somewhat forwards; while those on the other side *H I* will have surpassed the perpendicular, and have begun to sway backwards; consequently at *G* the stalks will on both sides be convex towards *G*, and the ears in that place will be further asunder than in their state of rest, and will appear as it were rarefied when viewed by a spectator so distant as to take in a great extent at once. Still further in rear of the wind, as 50 feet, at *L*, the 50th ear will have swung backwards as far as possible, and will just have its motion destroyed. The preceding stalk, *K*, will still want somewhat of its extreme backward flexure; the subsequent one, *M* will already have risen a little, and therefore the interval of the ears *R N* will be just what it was in the state of rest. At *L*, then, the spectator will see the ears at their natural distances from each other. Again the 75th stalk, *Q*, in rear of the wind will have had time to rise again erect from its backward inclination, three fourths of a second having elapsed since its first bending forward. The 74th, *P*, will not be quite erected; the 76th will have surpassed the erect state, and have again begun to lean forward. The stalks then on both sides of *Q* will curve towards *Q*, and their ears will therefore be closer together than in their natural state, and will appear condensed to the spectator above mentioned. Finally, the 99th, 100th, and 101st ears will be again in the same relative state as the 49th, 50th, and 51st; only leaning

A.E. Garrod on "The Spectra of Polarized Light."

Fig 1

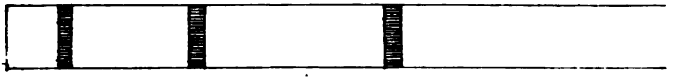
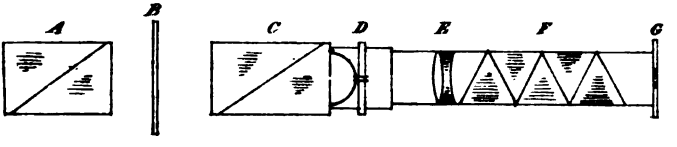


Fig 2

a. Plane Polarized Light.
b. Circularly Polarized Light.
c. Elliptically Polarized Light.

Fig 3



A. Polarizer. B. Selenite Plate. C. Analyser. D. Slit of Spectroscope.
E. Lens. F. Prisms. G. Eyepiece.

Fig 4

Fig 5

Fig. 1. Spectrum of a 3-band Selenite Plate.

Fig. 2. Spectrum of a 3 band Selenite Plate shewing the distribution of Plane, Circularly & Elliptically Polarized light, through the Spectrum.

Fig. 3. The component parts of the Spectro-Polariscope.

Figs. 4 & 5. Spectra of 6 & 12-band plates shewing the relative breadth of the bands.

forwards instead of backwards, and therefore neither condensed nor rarefied. The field then will present to the spectator a series of alternate condensations and rarefactions of the ears of corn, separated by intervals in their natural state of density; and this series will extend so far in the rear of the wind, till the air and want of perfect elasticity in the stalk shall have reduced them to rest, and these alterations, by the difference of shading they offer, will become apparent to his sight as dark and bright zones. It matters not for our present purpose, that the impulse is, in the case here taken, not propagated mechanically from ear to ear by mutual impulse, but that each moves independently of all the rest. All we want to illustrate is the distinction between the wave and the moving matter, and the independence of their motions. The waves here run along with the speed of the wind, whatever that may be: for it is always the point 25 feet in rear of the wind that is more rarefied, and that at 75 that is most condensed; and the interval between the first and 100th ear, comprehending ears in every state or phase of their vibrations is what we term the wave. The velocity of the wave, then, is in this case that of the wind; and is totally distinct from, and independent of, that of each or any particular ear. The one is a constant, the other a variable quantity; the one a general resulting phenomenon, the other a particular, individual mechanical process, going on according to its own laws.

Neither is it of the least consequence whether the excursions of the several stalks from their position of rest be great or little; whether the degree of bending, or force of the wind, be great or small, provided its velocity be constant. In the case of wind, indeed, the force depends on the velocity; but if we conceive the impulse given by a rigid rod made to sweep across the field, any greater or less degree of flexure might be given, with the same velocity, by a mere change of its level; but the velocity of the wave would still be that of the rod in every case.

I have entered very fully into the above instance of wave motion, on account of the very perfect illustration it affords of what are called Sound-Waves. You know that the space between you and any sonorous body is closely filled with air, and this air, if our eyes were microscopically constructed, would be seen by us to be nothing more than a collection of very small particles, like indefinitely diminished grains of shot. When the sounding body is struck, its particles are thrown into a state of vibration, and you can easily imagine how the particles of air surrounding the body would take up this vibration, and then these impinging on the next layer of particles would make them vibrate to and fro, and so on, till at last the particles surrounding ourselves take up the motion, and these striking our nerves of hearing, cause us to experience the sensation which we call sound.

If our sight were keen enough, we should see the particles of air behaving in an exactly similar manner to the ears of corn, when a gust of wind passes over them, with this one difference; that whereas each ear of corn owed its vibration directly to the wind, in the case of sound, it is only the first set of particles that are struck; all that follow owe their motion by impact to those that immediately precede. But the analogy between the two motions is perfect in other respects, we should see at one place particles more closely packed, followed, at a further distance, by a set of particles more apart, and this alternation of grouping would be seen by us to travel at a definite rate between the sounding body and ourselves. But how could such a motion furnish us with all the different varieties of sound. Some are loud, others faint, some are musical, others mere noises. Of the musical sounds you will have notes of varying pitch, that is, some notes will be shrill, others low. Well it is ascertained that when the sound is loud, the amplitude of vibrations will be larger than when the sound is faint, *i.e.*, the particles will make longer journeys to and fro; if the sound is musical it means that the waves which reach us follow in a regular order. When the waves are discontinuous and broken, we experience the sensation of noise. The pitch of a note depends on the rate at which the particles are moving backwards and forwards, thus it is found that when the particles are made to vibrate sixteen times in a second, the ear can just distinguish the lowest note. When the vibrations are less numerous than about sixteen per second, the ear loses the impression of a continued sound; and perceives first a fluttering noise, then a quick rattle, then a succession of distinct sounds capable of being counted. On the other hand when the frequency of the vibrations exceeds a certain limit all sense of pitch is lost; a shrill squeak or chirp only is heard.

Without going into details I might briefly explain to you what is meant by the "undulatory theory of light." In this theory, it is assumed that the sensation of light is produced by the oscillatory motion of a very rare and very elastic substance called *ether*; this substance it is assumed pervades all space, so that just as in sound we become conscious of sound by a wave-motion, so we become conscious of the presence of a luminous body by the waves in this ether caused by the vibrations of the body itself; but the motion of the particles of ether is not like the motion of the particles of air in the case of sound, or the backward and forward motion of the ears of corn when a gust of wind passes over them; it is better represented by the motion of a stretched string when a blow is given to it. It is expressed by saying that the vibrations of the particles are *transverse to the direction of propagation of the wave*. The intensity of light depends on the extent of vibration of the particles of either; the kind of light, *i.e.*, the colour of the light, on the rate at which the particles are vibrating, so that you see *intensity of light*

corresponds to *loudness in sound*, *colour* in light to *pitch* in sound. I mean to say no more about sound or light, I have merely enunciated the theories about them as explanatory of the matter in hand. Before concluding, I would wish to say a few words about the interference of waves, it is a subject I should like to treat separately, perhaps on some other occasion I may do so, but the following illustration due to Herschel will not be an unfit ending to the present paper.

If two waves, or rather two regular series of equal waves all exactly like one another, and all having set out initially from one common origin reach the same point by two different channe's or lines of communication differing just so much in length that the crests of the one series shall reach it at the same identical moment with the crests of the other; the two series of crests conspiring and being superposed on each other will produce crests of double the height of either singly; while on the other hand, if the difference of channels be such that the crests of the first series shall reach it simultaneously with the troughs (or lowest depressions) of the second: the one will destroy the other, and there will be neither elevation nor depression at their joint point of arrival. (Fig. 10 and 11) In the former case, supposing the two channels thenceforward to unite into one (as in the annexed figures which require no explanation further than that the series of cross lines represent the crests of the waves) the two series when they re-unite in a channel *CD* as in fig. 10, the exact size of the initial one, *AB*, will form a joint series exactly similar to that in *AB*, which will run on in that channel thenceforward; but on the latter as in fig. 11 there will be produced no waves at all, and the water in *CD* will (except just close to the point of junction, where some kind of eddy will be formed) remain undisturbed. Accepting the term "Wave" in its most general sense in whatever way we suppose it propagated, whether by alternate up-and-down movements of the successive particles, as on water-waves, or by transverse lateral ones, as in a stretched cord wagged horizontally, or by direct to-and-fro vibration as in the air waves, in which sound consists, or in any more complex manner, the same considerations evidently apply. If two sets of exactly equal and similar waves can by any previous arrangement be made to arrive simultaneously at the entrance of one and the same "channel" (using these terms also in their most general sense) along which each set, separately might be freely propagated—*i.e.*, so that the foremost crest of the first set shall strike the mouth of the channel at the same moment with that of the other—they will combine and run along the channel as a single set or series of waves of double the height or intensity. In this case, they are said to arrive "in the same phase." The same will be the case if the foremost crest of the series be so timed (by the previous arrangements) as to reach the mouth

of the channel simultaneously with the second, third, or fourth crest of the other, in which case the one set is said to be in arrear or advance of the other (as the case may be) by one, two, or more "undulations." On the other hand if the foremost crest of the one set be so timed as to arrive simultaneously with the first, second, third, &c., trough of the other—up to the time of its arrival indeed, the one, two, or three foremost waves which are not contradicted will run forward;—but from the moment when the others begin to arrive, they will cease to be followed up by any more. In this case the one set is in advance or arrear of the other by exactly one, or three, or five "semi-undulations," and the series are said to be "in opposite phases." In the intermediate phases it is easy to see that a combined set of waves will be produced but intermediate in height, intensity, or amplitude, between those two extremes—viz., *nil* on the one hand and reduplication on the other.

The vibrations by which light and musical sounds are conveyed are so exceedingly minute and the shock conveyed by each separately to our nerves, in consequence, so small, that it requires a continued series of them to impress our senses. The first few vibrations therefore which run on "uninterfered with" produce no sensation, and are as if they existed not. And thus we see how it may happen, that in the case of a complete opposition of phase two equal musical sounds may produce silence, and two equal rays of light complete and continued darkness.

MEETINGS FOR MIDSUMMER TERM.

GENERAL MEETING MAY 12TH, 1875.

THIS was the regular meeting for making up the Sections. The plan of allowing attendance at Sectional Meetings to be voluntary was found to work so badly that compulsory attendance was again insisted upon.

The following arrangements were made:—

Physicial Section.—Meetings to be held on May 28th, June 18th, July 2nd.

Archæological Section.—May 20th, June 3rd, 17th; July 1st, 15th.

Geological Section.—Meetings to be held weekly, but days not fixed.

Ornithological Section.—Meetings to be held on May 14th, 28th; June 11th, 25th; July 9th.

Entomological Section.—Meetings to be held on May 19th, June 2nd, 16th, 30th; July 14th.

Botanical Section.—Meetings to be held on May 20th, 27th; June 3rd, 10th, 17th, 24th; July 1st, 8th, 15th.

General Meetings.—June 9th, July 7th.

Field Day on May 22nd.

Physical Section.—H. W. Thatcher, A. E. Garrod, R. Armitage, D. H. Davies, S. B. Pemberton, J. P. Grant, A. S. Bright, J. D. Rogers.

Archæological Section.—D. H. Davies, W. L. Mackintosh, G. Mackintosh, W. G. O. Cooper, G. R. Askwith, F. L. Wanklyn.

Geological Section.—N. Whiting, A. V. White, W. S. Robinson, C. R. Draper, A. J. Burness, F. S. Hookin.

Botanical Section.—H. W. Thatcher, W. M. H. Milner, F. G. Heaven, F. S. Hookin, F. E. F. Hooper, A. E. W. Blackburne.

Ornithological Section.—T. G. Balfour, W. M. Grove, C. E. Fox, C. E. Blackett-Ord, J. N. Atkinson, R. Armitage, E. W. Brown, E. P. Martin, E. Marshall, C. W. B. Jones, F. H. Furnival, J. Vans Agnew, R. F. Dixon, G. R. Rogers, F. W. L. Birdwood.

Entomological Section.—A. E. Garrod, N. Manders, E. Marshall, F. R. Drysdale, O. Elton, E. J. Reeves, A. E. W. Blackburne, — Mackenzie, T. A. Goddard, D. Vickers, P. G. Hill.

GENERAL MEETING, JUNE 9TH, 1875.

F. E. Hulme, Esq., F.L.S., F.S.A, read a paper on "Plants, their uses and associations." There were exhibited a series of Chalk Fossils, presented by Rev. J. F. Bright, a series of Aden Rocks, presented by Rev. G. W.

De Lisle; and some Bark Cloth, prepared by the Mojos Indians (2500 miles up the Amazon); and a couple of Weaver Bird's nests, presented by H. Grant-Dalton, Esq. (O.M.) There were thirty-one persons present.

GENERAL MEETING JULY 10TH, 1875.

Rev. F. W. Farrar, D.D., F.R.S., kindly gave a most interesting lecture on "Napoleon I.," at which there was a very large attendance. The Committee would have been glad to have published the lecture, but at Dr. Farrar's request, they are unable to do so. The lecture was too long to allow of any exhibitions. There were 99 persons present (75 from the School, 24 Visitors).

PHYSICAL SECTION.

THE Physical Section held two meetings during the Easter, and three during the Summer Term; the attendance at these meeting was up to the average, except at the meeting on July 15th, when the steady rain prevented most of the members from attending.

The numbers of the section last term were about the same as they have always been, viz., 42—the section numbered fifty in the Summer Term of 1874, when it had the charm of novelty. We have always had a good supply of papers, thanks to the exertions of Mr. Harding, Mr. Drury, and members of the section. Appended is a report of the meetings.

EASTER TERM.

FIRST MEETING.

R. W. Doyne read a paper on "The Electric Telegraph," illustrated by instruments.

A. E. Garrod read a paper on "The Correllation of the Physical Force," illustrated by experiments. There were thirty-two persons present.

SECOND MEETING.

T. O. Harding, Esq., read a paper on "The Sources of Power in Nature." There were twenty-three persons present.

SUMMER TERM.

MEETING MAY 28TH.

J. D. Rogers read a paper on "The Bearing of Physical Discovery upon the Theory and Practice of Music." There were twenty persons present.

MEETING JUNE 18TH.

A. E. Garrod read a paper on "The Spectra of Polarised Light." There were twenty-three persons present.

MEETING JULY 15TH.

H. D. Drury, Esq., read a paper on "Wave Motion."

A. E. Garrod read a paper on "The Spectroscope and Dicroic Substances."

G. F. Rodwell, Esq., announced that the Secretary of the Section, A. E. Garrod, was leaving, and returned thanks to him for having filled the office since the foundation of the section.

The attendance was very poor, owing to the state of the weather.

ENTOMOLOGICAL SECTION.

Members—A. E. Garrod (head), J. P. Grant, E. S. Marshall, O. Elton, J. H. Dalton, R. A. S. Hill, A. E. W. Blackburne, A. W. Goddard, N. Manders, E. J. Reeves, F. M. Drysdale.

Much Entomological work cannot be expected in the Easter term, but the meetings might have been better attended; it must however be taken into account that the section was just emerging from a long period during which its energies had been dormant. There had been no constituted section, no meetings, and no entry of notices. When therefore the meetings were resumed, it was natural that the section should be very small. During the Lent term, Mr. Preston kindly delivered two lectures on "The structure of Insects," and the other meetings were taken up with exhibitions, etc. On the return of Summer the energy of the section seemed to revive, the meetings have during this term been very well attended, the section numbering 11, and there have been no cases of inexcusable absence from meetings. The members too seem to take more interest in the section, and several of them have come forward with papers, but the list of notices is very poor, though the number of collectors does not seem to have decreased since the days of Meyrick, but he himself was responsible for at least two thirds of the moths caught. Appended is a report of the meetings during the summer term:—

Meeting Wednesday, June 2nd.—The time was occupied with exhibitions.

Meeting Wednesday, June 16th.—A. E. Garrod read a paper on "Butterfly Collecting."

Meeting Wednesday, June 30th.—J. P. Grant read a paper on "The Genus Colias," and N. Manders on "Fritillaries."

Meeting Tuesday, July 13th.—O. Elton read a paper on "Hawk Moths," F. M. Drysdale on "Blues," and A. E. W. Blackburne on "Larvæ."

A. E. GARROD.

July 14th, 1875.

NOTICES RECORDED AT SCHOOL.

The following is the list of those who obtained notices:—

R.W.C.	...	...	...	...	R. W. Cooper.
F.M.D.	...	...	...	...	F. M. Drysdale.
E.O.F.	...	...	...	...	E. O. Fountain.
H.R.H.	...	...	...	...	H. R. Hordern.

W.E.L.	W. E. Lascelles.
N.M.	N. Manders.
E.J.R.	E. J. Reeves.
W.M.R.	W. M. Richards.
H.S.S.	H. S. Smith.
P.T.	P. Thicknesse.

Colias Edusa	Clouded Yellow	July 19, N.M., F.M.D.
Euchloe Cardamines	Orange tip.	May 11, E.O.F.
Pieris Brassicæ	Large White	April 16, N.M.
Pieris Rapæ	Small White	April 30, N.M.
Pieris Napi	Green Veined White ...	April 19, N.M.
Arge Galathea	Marbled White	July 6, N.M.
Hipparchia Tithonus ...	Gate-keeper	July 3, N.M.
Hipparchia Hyperanthus...	Ringlet	July 3, N.M.
Lasiommata Megæra ...	Wall Brown	May 22, E.J.R.
Lasiommata Egeria	Wood Argus	May 11, E.O.F.
Cœnonympha Pamphilus ...	Small Heath	May 13, E.J.R.
Limenitis Sibilla	White Admiral	July 6, N.M.
Cynthia Cardui	Painted Lady	June 16, P.T., and R.W.C.
Vanessa Atalanta	Red Admiral	June 5, N.M.
Vanessa Io...	Peacock	January 17, N.M.
Vanessa Urticæ	Small Tortoise-shell ...	Feb. 15, F.M.D.
Vanessa Polychloros ...	Large Tortoise-shell ...	April 13, N.M.
Argynnis Paphia	Silver Washed Fritillary	July 6, N.M.
Argynnis Euphrosyne ...	Pearl-bordered Fritillary	May 13, E.O.F.
Argynnis Aglaia	Dark Green Fritillary ...	June 27, W.E.L.
Nemeobius Lucina	Duke of Burgundy Fritillary	May 25, N.M.
Thecla W. Album	White-letter Hairstreak	July 6, N.M. July 13, N.M., 11 sp.
Thecla Quercus	Purple Hairstreak	July 6, N.M.
Thecla Rubi	Green Hairstreak	May 17, E.O.F.
Chrysophanus Phlæas ...	Small Copper	May 16, H.S.S.
Polyommatus Alsus	Small Blue	E.O.F.
Polyommatus Alexis ...	Common Blue	May 24, E.O.F.
Thymele Alveolus	Grizzled Skipper	May 11, N.M.
Thanaos Tages	Dingy Skipper	May 11, N.M.
Pamphila Linea...	Small Skipper	July 3, N.M.
Macroglossa Stellatarum ...	Humming-bird	June 14, W.M.R.
Cerura Vinula	Puss Moth	June 11, H.R.H.
Acronycta Psi	Dagger Moth	June 7, R.W.C.

Cucullia Umbratica ... ... Shark ... ... June 11, F.E.S.
Odontopera Bidentata ... Scalloped Hazel ... ... June 15, R.W.C.

Subjoined is a list of New or Local species, taken by E. Meyrick, Esq., since the last Report. Those printed in capitals are new to our list.

RHOPALOCERA.

Limenitis Sibilla ... ... Henswood ... ... July 26.

BOMBYCINA.

Cybosia Mesomella ... ... Bedwyn ... ... July 29.

NOCTUINA.

Thyatira Derasa ... ... Marlborough ... ... July 14.
Neuria Saponariae... ... ... Ramsbury ... ... June 30.
Dianthœcia Carpophaga ... Ramsbury ... ... June 30.

GEOMETRINA.

Geometra Papilionaria ... ... Boltsridge ... ... July 16.
(previous occurrence unauthenticated)
Eubolia Bipunctaria ... ... common on downs ... ... July 25th.
E. Lineolata ... ... common on downs... ... July 25th.

CRAMBITES.

EUDOREA CEMBRÆ ... ... Ramsbury ... ... July 12.
MYELOIS CIRRIGERELLA ... vid. note

TORTRICINA.

POEDISCA OPHTHALMICANA ... Thrup ... ... Oct 4, 1874.
PERONEA RUFANA ... ... erroneously recorded in the last list as Umbrana
Anisotaenia Ulmana ... ... Blakes W. ... ... July 25.
CNEPHASIA PASCUANA ... ... Ramsbury ... ... July 30.
EUPOECILIA MANNIANA ... ... vid. note ... ...
E. RUPICOLA this is the West Woods insect, previously wrongly named Subroseana.

TINEINA.

NEMOTOIS SCABIOSELLUS ... Thrup ... ... Aug. 4-9.
DEPRESSARIA PASTINACELLA... Ramsbury ... ... Oct., 1874.
ANARSIA SPARTIELLA ... ... Bedwyn ... ... July 29.
SOPHRONIA PARENTHESELLA .. Henswood ... ... July 3.
ARGYRESTHIA RETINELLA ... Bedwyn ... ... July 16.
A. Pygmaeella ... ... Bedwyn ... ... July 16.

COLEOPHORA ARGENTULA ...	Mildenhall	Oct., 1874. (larvae).
BATRACHEDRA PINICOLELLA ..	Blakes W.	July 13.
OINOPHILA V-FLAVA	Ramsbury	July 17.
Nepticula Septembrella ..	bred from Hypericum collected in Cakewood	May 2-8.

PTEROPHORINA.

PTEROPHORUS TETRADACTYLUS	Common Frith ... ..t	July 15.

Note 1.—*Myelois Cirrigerella.* This species is new to Britain, and is recorded in the last vol. of the Ent. Mo. Mag. It has been taken only in a garden at Ramsbury, where it comes to light at the end of June, and appears very local.

Note 2.—*Eupœcilia Manniana.* This also is of comparatively recent addition to the British list. It was long before I could identify it; it has appeared in previous lists as *E. luridana* and *E. notulana.* It is not uncommon in our district on dry flowery banks generally, but is usually considered elsewhere very scarce.

ORNITHOLOGICAL NOTICES.—JAN. TO JULY, 1875.

Initials stand for the following names:—

J.V.A.	J. Vans Agnew.
P.R.A.	P. R. Arrowsmith.
E.A.	E. Acton.
T.G.B.	T. G. Balfour.
C.W.B.	C. W. Bowlby.
A.C.B.	A. C. Baillie.
K.C.B.	K. C. Bellhouse.
C.S.B.	C. S. Bengough.
W.O.C.	W. O. Charlton.
W.F.C.	W. F. Crowe.
R.F.D.	R. F. Dixon.
G.H.D.	G. H. Dawson, Esq.
A.G.D.	A. G. Daubeny.
F.M.D.	F. M. Drysdale.
J.A.L.F.	J. A. L. Fellowes.
E.N.F.	E. N. Fellowes.
F.H.F.	F. H. Furnival.
W.M.G.	W. M. Grove.
H.R.H.	H. R. Hordern.
A.A.H.	A. A. Handley.
H.T.L.	H. T. Lucas.
E.L.L.	E. L. Lucas.
E.S.M.	E. S. Marshall.
E.P.M.	E. P. Martin.
G.R.R.	G. R. Rogers.
M.R.	M. Rogers.
J.R.R.	J. R. Radford.
W.M.R.	W. M. Richards.
F.E.R.	F. E. Rooke.
H.M.S.	H. M. Sanders.
C.P.W.	C. P. Wilson.
J.E.W.	J. E. Williams.
E.W.	E. Ward.
L.Y.	L. Youngs.
J.J.Y.	J. J. Youngs.

Kestrel—2, May 12th, E.P.M., R.F.D.

Sparrow-hawk—1, May 5, C.P.W.

Long-Eared Owl—1, March 18th, W.M.G ; 4, March 25th, W.M.G., J.R.R.

White Owl.

Tawny Owl.

Red-backed Shrike—Seen May 13th, E.S.M.; 3, May 23rd, E.P.M., G.R.R.

Spotted Flycatcher—Seen May 11th, E S.M.; 5, May 31st, J.A.L.F.; 5, June 2nd, T.G.B.

Missel Thrush—2 eggs, March 30th, W.M.G., J.R.R.; 1, Ap. 5th, E.N.F.; young flying, May 10th, E.S.M., T.G.B.

Song Thrush—Singing, Feb. 3rd, G.H.D.; 2, Ap. 3rd, H.R.H.; 2, Ap. 4th, J.A.L.F.; young flying, May 12th, E.S.M., T.G.B.

Blackbird—1, Ap. 4th, H.R.H.; 5, Ap. 7th, W.M.R., C.W.B.; 3, June 24th, T.G.B., E.S.M.; young flying, May 16th, E.S.M.

Ring Ouzel.

Hedge Accentor—1, May 5th, T.G.B., E.S.M.; young, May 23rd, T.G.B., E.S M.; young flying, May 30th, T.G.B., E.S.M.

Redbreast—Singing, March 3rd, E.P.M., J.E.W.; young flying, May 10th, E.S.M., J.V.A.

Redstart—6, May 5th, E.P.M., R.F.D., W.O.C.; young flying, June 7th, T.G.B., E.S.M.

Stonechat—Seen, March 25th, W.M.G., J.R.R.

Whinchat—Seen, March 9th, E.S.M.

Wheatear—Seen, April 6th, E.S.M.

Grasshopper Warbler.

Sedge Warbler—Seen, March 23rd, E.S.M.; 2, May 21st, G.R.R., M.R., A.G.D.; 5, h.s., May 26th, E.S.M.

Reed Warbler—Seen and heard, May 14th, E.S.M., T.G.B.

Nightingale.

Blackcap—Seen, May 6th, T.G.B., E.S.M.; singing, May 11th, E.S.M.; 4, May 23rd, W.F.C.

Garden Warbler—Seen and heard, May 20th, E.S.M.

White throat—Seen, May 3rd, T.G.B.; building, May 9th, E.S.M., T.G.B.; 8, May 16th, E.S.M.; young flying, June 24th, T.G.B., E.S.M.

Lesser White Throat—Seen, May 16th, E.S.M.; 4, May 18th, P.R.A.

Wood Warbler.

Willow Warbler—Singing, Ap. 6th, E.S.M.; 6, May 18th, E.A.; young flying, June 11th, T.G.B., E.S.M.

Chiff Chaff—Seen, Ap. 3rd, G.H.D.; 7, May 24th, E.S.M.

Golden crested Regulus—Singing, March 20th, E.S.M.

Greater Tit—8, May 11th, E.S.M., W.O.C., R.F.D.

Blue Tit—Building, May 6th, E.S.M., T.G.B.; 14, May 16th, E.P.M., W.O.C.; young, May 29th, E.S.M., J.V.A.

Cole Tit—Young, May 16th, E.P.M., W.O.C., R.F.D.; 6, May 27th, E.P.M.

Long-tailed Tit—Nest lined, March 26th, E.L.L., A.C.B.

Pied Wagtail—1, May 13th, F.H.F.

Grey Wagtail—Seen, June 4th, T.G.B., E.S.M.

Tree Pipit—Singing, May 10th, E.S.M., J.V.A.; young, June 8th, T.G.B., E.S.M.

Meadow Pipit—Singing, March 16th, E.S.M.; seen, March 25th, W.M.G., J.R.R.

Skylark—Singing, Jan. 31st, G.H.D.; young, May 19th, T.G.B., E.S.M.

Bunting.

Black-headed Bunting.

Yellow Bunting—Building, May 8th, E.S.M., T.G.B.; 4, May 11th, L.Y., J.J.Y.; young, May 26th, E.S.M., W.M.G.

Chaffinch—Singing, Feb. 15th, G.H.D.; 2, May 6th, M.R., A.G.D.; 4, May 11th, E.P.M., W.O.C.; young flying, May 20th, T.G.B., E.S.M.

House Sparrow—5, May 8th, E.P.M., M.R., G.R.R.

Greenfinch—Singing, March 21st, E.S.M.; building, May 8th, E.S.M., T.G.B.; 3, May 9th, W.O.C., E.P.M., F.M.D.

Hawfinch.

Goldfinch.

Linnet—Singing, Ap. 7th, E.S.M.; 5, May 4th, T.G.B.

Lesser Red-pole—Seen, May 4th, T.G.B.

Bullfinch—Singing, March 21st, E.S.M.; 2, May 15th, E.S.M., T.G.B.

Starling—5, May 6th, W.O.C., E.P.M., R.S.D.; 4, h.s., May 10th, E.S.M., T.G.B.; young, May 14th, E.S.M., T.G.B.; flying, June 1st, T.G.B.

Carrion Crow.

Rook—Building, March 6th, E.P.M; March 3rd, E.P.M., J.E.W.; 1, 2, March 20th, E.P.M., W.O.C., F.H.F.; young flying, May 11th, E.S.M.

Jackdaw—Building, May 25th, W.M.G., J.R.R.; 1, May 5th, R.S.D., E.P.M.; 4, May 6th, F.E.R., M.R.

Magpie—4, May 6th, E.P.M., W.O.C., R.F.D.; 6, May 18th, E.S.M., T.G.B.

Jay—2, May 5th, M.R., G.R.R., E.W.; 5, h.s., May 18th, E.S.M., T.G.B.; young, June 8th, E.S.M., T.G.B.

Green Wood-pecker—1, F.E.R., May 6th; 2. June 4th, W.O.C., M.R.

Creeper—4, May 20th, E.P.M., R.F.D.; 7, May 26th, G.R.R., F.M.D.

Wren—Building, May 5th, R.F.D., H.M.S.; 1, May 9th, A.A.H., G.R.R., M.R.; young flying, June 3rd, E.S.M., T.G.B.

Nuthatch—13, May 17th, E.P.M, W.O.C., R.F.D.; young flying, June 6th, T.G.B., E.S.M.

Cuckoo—Heard, May 3rd, T.G.B.

Kingfisher.

Swallow—Building, May 19th, E.S.M., T.G.B.; young, June 19th, E.S.M., T.G.B.

Martin—Seen, May 8th, E.S.M., T.G.B.; building, May 11th, E.S.M.

Sand Martin—Seen, May 12th, E.S.M., T.G.B.; eggs, May 22nd, E P.M., R.F.D.

Swift—Seen, May 7th, T.G.B., E.S.M.

Goat-sucker.

Ring Dove—2, Ap. 4th, G.R.R. M.R.

Stock Dove—1, h s., June 1st, R.F.D., G.R.R.; Young, June 5th, G.R.R., M.R. E.A.

Turtle Dove—Seen, May 11th, E.S.M.; 2, May 16th, W.M.G., T.G.B.

Pheasant—10, May 26th, T.G.B.

Partridge—Paired, Feb. 15th, G.H.D.; 1, H.T.L., March 27th.

Quail.

Peewit—Scratches, May 25th, W.M.G., J.R.R.; 1, K.C.B., C.S.B., March 27th; 2, March 27th, F.H.F.; 4, March 30th, W.M.G., J.R.R.

Landrail—Heard, May 3rd, T.G.B.

Water-rail.

Moorhen—5, May 5th, E.S.M., T.G.B.; young, May 10th, E.S.M., T.G.B.

Coot.

Wild Duck—2, seen, May 16th, T.G.B.; young, May 25th, E.S.M., T.G.B.

Little Grebe—Summer plumage, March 9th, E.S.M.; 1, May 14th, E.S.M., T.G.B.; 5, h.s., May 25th, E.S.M., T.G.B.

Fieldfare—Seen, March 22nd, E.S.M.; 1, seen, May 13th, E.S.M.

Red legged Partridge—Seen, March 19th, E.S.M.

BOTANICAL NOTICES.

The following list of notices will show a very fair amount of activity among members of the School. There are but few plants un-noticed, and several new species have been added to our list. The Easter holidays caused a serious break in our observations, and consequently some important dates have been lost. As usual "by" before a date indicates that the species had apparently been out a day or two before being observed, and an asterisk (*) indicates cultivated specimens.

Names of those whose initals occur in the following List:—

J.A.	J. Adams.
C.W.B.	C. W. Bowlby.
R.J.D.C.	R. J. De Coetlogon.
E.M.R.C.	E. M. R. Cox.
G.W.D.L.	Rev. G. W. DeLisle.
J.F.D.	J. F. Duthie, Esq.
F.W.F.	Rev. F. W. Farrar, D.D., F.R.S.
K.G.	Miss K. Gwillim.
F.G.H	F. G. Heaven.
F.E.H.	F. E. Hooper.
W.M.H.M.	W. M. H. Milner.
R.D.P.	R. D. Peele.
W.M.R.	W. M. Richards.
M.R.	M. Rogers.
G.F.R.	G. F. Rodwell, Esq.
H.M.S.	H. M. Sanders.
S.S.	S. Smith.
C.E.S.	C. E. Stevens.
E.T.	E. Tanner.
E.T.	Miss E. Thomas.
H.W.T.	H. W. Thatcher.
F.E.T.	F. E. Thompson, Esq.
C.E.T.	Rev. C. E. Thorpe.
M. & H.	W. M. H. Milner and F. G. Heaven.
T. & M.	F. E. Thompson, Esq., and W. M. H. Milner.

Clematis
vitalba ..... not in fl. July 29.
Thaliotrum
flavum ..... June 17.
Anemone
nemorosa ..... March 10, F.E.T.; March 17, M.R.
Myosurus
minimus ..... quite over May 15.
Ranunculus
penicillatus ... Ap. 17, C.E.T.
peltatus ..... full May 13.
circinatus ... July 3.
flammula..... by June 5.
ficaria ..... Jan. 25, Feb. 1; K.G.
auricomus ... full May 3.
acris ..... March 31, F.E.T.
repens ..... May 3, (full.)
bulbosus ..... Ap. 17, C.E.T.
arvensis ..... May 15, G.W.D.L.
parviflorus ... by May 15, F.W.F.; *May 3.
Caltha
palustris ..... March 14, T. & M.; March 27, F.E.H.
Eranthis
*hyemalis ... Jan 21.
Helleborus
viridis ..... Feb. 16, F.E.T.
*fœtidus ..... March 16.
Aquilegia
vulgaris ..... May 23, H.W.T.
Papaver
Argemone ... May 17, (Woodborough.)
Rhœas ..... May 21, C.E.T.
Lecoqii..... full bud May 17, (Woodborough.)
Chelidonium
majus ..... May 2.
Corydalis
*solida ..... March 29.
Fumaria
officinalis ..... May 9, C.E.T
Nasturtium
officinale ..... June 1.
palustre ..... May 22.
Barbarea
vulgaris ..... May 3, (full.
Cardamine
sylvatica ..... May 3, (full.)
hirsuta ..... Jan. 25.
pratensis ..... Ap. 26, C.E.T.
Sisymbrium
officinale ..... May 9, C.E.T.
Erysimum
cheiranthoides June 26, F.E.T.
Alliaria
officinalis ..... May 3, (full.)
Brassica
oleracea ..... full May 16, W.M.H.M.
campestris ... June 1.
napus ..... May 3, (full.)
Sinapis
arvensis ..... Ap. 27, C.E.T.
Diplotaxis
muralis ..... June 26, H.W.T.
Draba
verna ..... Feb. 4, F.E.T.; March 14, T. & M.
Lepidium
campestre ... May 5, G.W.D.L.; M. & H.
Capsella
bursa-pastoris full May 3.
Senebiera
coronopus ... May 3.
Raphanus
Raphanistrum full June 12.
Reseda

lutea ..... June 8, F.E.T.
Helianthemum
vulgare ..... May 22, W.M.H.M.
Viola
odorata ..... March 13.
hirta..... full March 28, E.T.; Ap. 4, F.E.T.
Reichenbachiana full May 13.
Riviniana ... Ap. 8, F.E.T.
canina ..... by May 8, M. & H.
arvensis ..... May 3.
Polygala
vulgaris ..... May 10, G.W.D.L; [May 5, M. & H.]
calcarea ..... full June 8, J.F.D.
oxyptera ..... full June 8, J.F.D.
depressa ..... full June 8, J.F.D.
Silene
inflata ..... May 23, G.W.D.L.
Lychnis
flos-cuculi ... May 17, (Woodborough.)
vespertina ... May 17, (Woodborough.)
diurna ..... by May 3.
Githago ..... May 23, (Wolfhall), G.W.D.L.
Sagina
procumbens... May 15, W.M.H.M.
Arenaria
trinervis ..... May 12, G.W.D.L.
serpyllifolia... May 22.
Stellaria
media ..... all the year.
Holostea ..... Ap. 7, F.E.T., (New Mill); full May 3.
graminea..... June 5, W.M.H.M.
uliginosa..... May 22, (Wolfhall.)
Cerastium
glomeratum... full May 3.
triviale ..... full May 3.
Moenchia
erecta ..... full May 11, G.W.D.L.
Malva
moschata ... June 22, H.W.T.
sylvestris..... June 5.
rotundifolia... May 15, G.W.D.L.
Tilia
parvifolia..... July 9, H.W.T.
Hypericum
tetrapterum cold. bud, July 3.
perforatum ... July 7, G.W.D.L.
humifusum ... about June 15.
hirsutum ... June 26.
pulchrum ... June 29, H.W.T.
Acer
campestre ... May 14, C.E.T.
Pseudo-platanus May 3.
Æsculus
Hippocastanum [May 5, M. & H.,] May 6, G.W.D.L.
Geranium
pratense ..... June 1.
dissectum..... May 16, M. and H.
columbinum May 14, G.W.D.L.
molle ..... May 14, G.W.D.L.
lucidum ..... May 5.
Robertianum May 3, full
Linum
Catharticum May 15, F.W.F.
Oxalis
acetosella ... full My. 11, G.W.D.L.
Euonymus ...
Europæus ... May 24, C.E.T.
Staphylea ...
*pinnata ... May 5.
Rhamnus
catharticus ... full June 5.
Ulex
Europæus ... all the year.

Genista	
tinctoria	June 26, H.W.T. (Binck Knoll).
Sarothamnus	
scoparius	by May 3.
Ononis	
arvensis	July 7, G.W.D.L.
campestris ...	July 3, F.E.T.
Medicago	
lupulina	full May 3.
Trifolium	
pratense	May 3, F.E.T.
*incarnatum...	May 22.
medium	July 3.
repens	May 15.
procumbens	June 5, full
minus	full May 15.
Lotus	
corniculatus	May 16, M. and H.
major	June 24.
Anthyllis	
vulneraria ...	May 15, G.W.D.L.
Astragalus	
glycyphyllos	June 26.
Vicia	
hirsuta..... ..	May 14, G.W.D.L.
tetrasperma	June 6; M. & H., full.
Cracca.....	June 5, W.M.H.M.
sylvatica	full June 24.
sepium.....	May 3, full.
sativa	May 15, G.W.D.L.
Lathyrus	
pratensis.....	May 27, G.W.D.L.
macrorhizus	full My. 5, R.J.D.C.
sylvestris ...	June 26, F.E.T.
Hippocrepis	
comosa	May 17, G.W.D.L.
Onobrychis	
sativa	May 16, M. and H.
Cytisus	
*Laburnum	May 18, G.W.D.L.
Prunus	
spinosa	April 9, E.M.R.C., April 12, C.E.T.
Spiræa	
ulmaria	June 17.
Filipendula...	June 27, M. and H.
Sanguisorba	
officinalis ...	full Jn. 26, H.W.T. (Binck Knoll).
Poterium	
Sanguisorba	May 3.
Agrimonia	
eupatoria.....	June 13, C.E.T.
Alchemilla	
vulgaris	May 3.
arvensis	full May 13.
Potentilla	
anserina	May 13, H.W.T.
reptans	June 5.
Tormentilla...	May 10, G.W.D.L.
fragariastrum	March 5, F.E.T.
Fragaria	
vesca	May 10, G.W.D.L.
Rubus	
Idæus	June 19, H.W.T.
cæsius	May 17 (Woodborough), F.E.T.; My. 31, G.W.D.L.
Geum	
urbanum	May 9, C.E.T.; [May 5, M & H.]
rivale	May 3, full
Rosa	
tomentosa ...	full June 24.
canina	May 30, M. and H.
arvensis	June 21, F.E.T.
Crataegus	
oxyacantha...	May 15, W.M.H.M.
Pyrus	
malus	April 30, C.E.T.
*aucuparia ...	May 15.

Epilobium
hirsutum..... July 18.
angustifolium June 24, F.E.T.
parviflorum... July 3.
montanum ... June 12, H.W.T.
Circæa
lutetiana..... June 26 (Binck Knoll), F.E.T., July 1.
Montia
fontana ..... over May 13.
Bryonia
dioica ..... June 6, M. and H.
Spergula
arvensis ..... My. 22 (Wolf-hall), G.W.D.L.
Scleranthus
annuus ..... My.15,F.W.F.,full.
Sedum
reflexum ..... June 14, F.E.T.
acre ..... June 4.
Ribes
grossularia .. Ap. 1, G.W.D.L.
rubrum ..... full May 6.
*sanguineum Mch. 29.
Saxifraga
*crassifolia ... Mch. 29.
*cæspitosa ... Ap. 2, G.W.D.L.
tridactylites Mch. 28, F.E.T.
granulata ... May 10, G.W.D.L. [May 5, M. & H.]
Sanicula
Europæa ..... May14th,G.W.D.L.
Helosciadium
nodiflorum ... July 3.
Ægopodium ...
podagraria ... June 4.
Bunium
flexuosum ... nearly out May 15, G.W.D.L.; May 16, M. & T.
Pimpinella
saxifraga..... May 17, (Woodborough).
Sium
augustifolium July 22, W.M.H.M.
Œnanthe
fistulosa ..... fullJuly3,G.W.D.L.
crocata ..... June 5.
Æthusa
cynapium ... May 22,W.M.H.M; June, 26.
Silaus
pratensis..... July 3.
Pastinaca
sativa ..... June 7, H.W.T.
Heracleum
sphondylium May 3.
Daucus
carota ..... June 7, H.W.T.
Torilis
Anthriscus ... June 26.
nodosa ..... by June 26, H.W.T.
infesta ..... Juiy 3, W.M.H.M.
Scandix
pecten ..... full May 5.
Anthriscus
sylvestris..... Mch. 14, T. & M. Mch. 29, F.E.T.
Chærophyllum
temulum..... May 17, (Woodborough).
Conium
maculatum... full June 26.
Adoxa
moschatellina Mch. 14, T.&M.
Cornus
sanguinea ... June 5, W.M.H.M.
*mascula ..... Feb. 15.
Sambucus
nigra ..... May 17, (Woodborough), F.E.T.

Viburnum
lantana ..... May 3.
opulus ..... May 29, C.E.T.; fertile, June 1.
Lonicera
*caprifolium full May 17.
Periclymenum June 10, F.E.T.
Symphoricarpos
*racemosus May 30, M. & H.
Sherardia
arvensis ..... May 8, F.G.H.
Asperula
cynanchica ... June 8, J.F.D.
odorata ..... May 10, G.W.D.L.
Galium
cruciatum ... May 5, G.W.D.L.; M. & H.
Aparine ..... May 3, F.E.T.
Mollugo ..... June 5, W.M.H.M.
verum ..... June 24.
saxatile ..... May 29, G.W.D.L.
uliginosum ... June 19.
palustre ..... June 12.
tricorne ..... May 17.
Valeriana
officinalis..... June 17.
dioica ..... May 3, (full).
Valerianella
olitoria..... May 3, (full).
dentata? ..... May 14, G.W.D.L.
Knautia
arvensis ..... June 7, G.W.D.L. [May 29, F.G.H.]
Scabiosa
columbaria ... June 12, F.G.H.
Eupatorium
cannabinum nearly out July 3.
Petasites
vulgaris ..... Mch. 4, F.E.T.
Tussilago
Farfara ..... Feb. 1, G.W.D.L. Mch.10,G.W.D.L.
Bellis
perennis ..... all the year.
Achillea
Millefolium ... June 5, M. & H.
ptarmica..... bud, July 3, F.E.T.
Anthemis
cotula ..... June 26.
Matricaria
Parthenium .. just out June 19.
inodora ..... May 22, (Wolfhall).
Chrysanthemum
Leucanthemum May 16, M. & H. May22,G.W.D.L.
Gnaphalium ...
uliginosum ... July 3, F.E.T.
Senecio
vulgaris ..... all the year.
Jacobæa ..... June 19, F.E.T., June 24.
aquaticus..... June 17.
Serratula
tinctoria ..... July 3.
Centaurea
nigra ..... June 7, H.W.T.
cyanus..... .. June 3, G.W.D.L.
scabiosa ..... June 18, H.W.T.
Carduus
nutans ..... May 22,W.M.H.M.
crispus..... May 17, G.W.D.L.
lanceolatus ... July 3, (Binck-Knoll); July 19.
arvensis ..... June 26.
palustris ..... May 25, G.W.D.L.
acaulis..... June 8, J.F.D.; June 12,H.W.T.
Lapsana
communis ... June 17.
Hypochœris
radicata ..... May22, (Wolfhall), G.W.D.L.
Apargia
hispida ..... May22, (Wolfhall.)

autumnalis ... June 19.
Thrincia
hirta..... June 24.
Tragopogon
minor ..... fullJune3,G.W.D.L.
Helminthia
echioides ..... *July 27.
Lactuca
muralis ..... June 29, M. & H.
Leontodon
taraxacum ... all the year.
Sonchus
oleraceus..... full June 19.
asper ..... May 28, G.W.D.L.
arvensis ..... July 10, W.M.H.M.
Crepis
virens ..... May 17, G.W.D.L.; May 29, C.E.T.
Hieracium
pilosella ..... May 14, G.W.D.L.
vulgatum..... July 1.
Campanula
glomerata ... July 6, G.W.D.L.
Trachelium... July 7, G.W.D.L.
rotundifolia... June 26, (Binck-Knoll); July 11, S.S.
Specularia
hybrida ..... full May 26.
Monotropa
Hypopitis ... bud July 10.
Ilex
aquifolium ... May 14, C.E.T.
Ligustrum
vulgare ..... June 5, H.W.T.
Fraxinus
excelsior ..... Ap. 14, C.E.T.
Syringa
*vulgaris..... full May 3.
Vinca
minor ..... full May 12, G.W.D.L.
major ..... Ap. 1, H.M.S.
Erythræa
centaurium... July 10.
Menyanthes
trifoliata ..... full May 14, *Rev. K. Ward.*
Convolvulus
arvensis ..... June 5, W.M.H.M.
sepium..... July 10, W.M.H.M.
Cynoglossum
officinale ..... May 19, G.W.D L.
Lycopsis
arvensis ..... June 11, H.W.T.
Symphytum
officinale ..... full May 3.
asperrimum... May 12, G.W.D.L.
Echium
vulgare ..... June 7, H.W.T.
Lithospermum
officinale ..... May 27, G.W.D.L.
arvense ..... May 17, (Woodborough.)
Myosotis
palustris ..... June 17.
arvensis ..... May 5, G.W.D.L.
collina ..... full May 10, F.W.F.
versicolor..... May 13, G.W.D.L.
Solanum
Dulcamara ... June 10, F.E.T.
Atropa
*Belladonna.. May 16, H.W.T.
Lycium
*barbarum ... May 16, M. & H.
Orobanche
minor ..... full June 7, G.W.D.L.
Lathræa
squamaria ... Ap. 8, W.M.R.
Verbascum
Thapsus ..... June 26, (Binck-Knoll); June29, H.W.T.

nigrum..... July 11, C.E.T.
Linaria
cymbalaria ... May 15, G.W.D.L.
minor ..... May 23, G.W.D.L.
vulgaris ..... June 14, F.E.T.
Scrophularia
nodosa ..... June 5.
aquatica ..... June 19.
*vernalis ..... Ap. 2.
Melampyrum
pratense ..... May 27, G.W.D.L.
Pedicularis
sylvatica ... .. May 16, G.W.D.L.
Rhinanthus
Crista-galli ... by May 17, F.G.H.
Euphrasia
officinalis..... June 26, (Binck-Knoll); July 6, G.W.D.L.
odontites ..... June 27, M. & H.
Veronica
Anagallis..... June 1.
Beccabunga... May 22, G.W.D.L.
Chamædrys... full May 3.
officinalis..... June 5, H.W.T.
serpyllifolia... May 10, G.W.D.L.
arvensis ..... full May 13.
polita ..... all the year.
Buxbaumii ... all the year.
hederifolia ... March 10, G.W.D.L., (probably earlier); [Feb. 25, M. & H.]
Mentha
arvensis ..... July 22, W.M.H.M.
Scutellaria
galericulata July 3, G.W.D.L.
Salvia
verbenaca ... June 5 (full)
Origanum
vulgare ..... bud July 3.
Thymus
serpyllum ... June 3, G.W.D.L.
Calamintha
officinalis ..... July 22, W.M.H.M.
clinopodium June 17.
Prunella
vulgaris ..... June 12, G.W.D.L.
Nepeta
Glechoma ... April 2, C.W.B., and W.M.B.
Lamium
amplexicaule full May 3.
purpureum ... all the year.
album ..... all the year; April 4, C.W.B. and W.M.B.
Galeobdolon May 5, G.W.D.L., M and H.
Galeopsis
Ladanum..... July 10, W.M.H.M.
Tetrahit ..... June 26 (Binck-Knoll); July 6, G.W.D.L.
Stachys
Betonica ..... June 17.
sylvatica ..... June 9, G.W.D.L.
palustris ..... July 22, W.M.H.M.
Ballota
fœtida ..... July 3, (Binck-Knoll); full July 10.
Ajuga
reptans ..... May 10, G.W.D.L.
Primula
vulgaris ..... Jan. 11, C.E.T.
veris..... ..... Feb. 4, F.E.T.; April 17 (Yatesbury) C.E.T.
Lysimachia
Nummularia June 19, F.E.T.
nemorum..... June 12, G.W.D.L.
Anagallis

arvensis ..... June 12, H.W.T.
Plantago
laceolata ..... May 3.
media ..... May 17 (Woodborough); *My.15.
major ..... June 6, M. and H.; June 10.
Chenopodium
album ..... June 26 (Binck-Knoll); July 1, G.W.D.L.
Bonus-Henricus full May 3.
Atriplex
angustifolia... June 26.
Rumex
sanguineus ... June 17.
obtusifolius... June 12.
crispus..... May 30, M. and H.
acetosa ..... May 16, M. and H.
acetosella ... May 13.
Polygonum
Bistorta ..... May 27, G.W.D.L.
amphibium ... July 3, G.W.D.L.
Persicaria ... June 24.
aviculare..... June 17.
convolvulus... June 19.
Daphne
*mezereum ... March 5.
Laureola ..... *Jan. 24, Feb. 1, G.W.D.L.
Buxus
sempervirens [May 5, M. & H.]
Euphorbia
Helioscopia... May 10, G.W.D.L.
amygdaloides May 5, G.W D.L.
Peplus ..... May 5, M. and H.
exigua ..... May 17, (Woodborough.)
Mercurialis
perennis ..... March 5, F.E.T.; fem. March 11.
Callitriche
verna ..... May 3.
Urtica
urens ..... full May 3.
dioica ..... May 17, F.E.T.
Ulmus
montana ..... March 9, G.F.R.
Salix
capres ..... Mch. 14, T. and M.
viminalis..... Mch. 14? T. and M.
triandra ..... full May 16.
Betula
glutinosa..... full My.6, G.W.D.L.
Fagus
sylvatica..... full May 6, C.E.T.
Castanea
vulgaris ..... July 26, H.W.T.
Quercus
Robur ..... nearly out, May 6, C.E.T.; May 15, G.W.D.L.
Corylus
avellana ..... Jan. 18, F.E.T.
Juglans
*regia ..... May 17.
Taxus
baccata ..... February 15.
Larix
Europæa ..... Mch. 24, G.W.D.L.; April 6, F.E.T.
Tamus
communis May 29, F.E.T.
Anacharis
alsinastrum... July 3.
Orchis
morio ..... by My. 5, G.W.D.L.
mascula ..... by My. 5, G.W.D.L.
ustulata ..... June 3, G.W.D.L.
maculata..... June 3, G.W.D.L.
incarnata ... full June 5.
pyramidalis... June 19, H.W.T.

Gymnadenia	
conopsea	June 3, G.W.D.L.
Habenaria	
viridis	July 26, H.W.T.
chlorantha ...	by June 1.
Ophrys	
apifera.....	July 3, F.E.T.
Listera	
ovata	May 24, F.E.T.; June 3.
Neottia	
nidus-avis ...	May 17, G.W.D.L.
Epipactis	
latifolia	budJuly10, H.W.T.
Iris	
pseud-acorus	May 30, C.E.T.
Narcissus	
pseudo-narcissus	Mch. 10, E.T., (not general).
Galanthus	
nivalis	Jan15, *Mr. Atkinson.*
Polygonatum	
multiflorum...	May 10, G.W.D.L.
Ruscus	
aculeatus.....	in flower May 30, M. & H.
Ornithogalum	
*umbellatum	full May 17.
Allium	
vineale.....	July 1.
ursinum	May 12, G.W.D.L.
Endymion	
nutans.....	Ap. 8, W.M.R. & R.D.P.
Juncus	
effusus	July 3.
glaucus	full July 3.
acutiflorus...	July 3.
lamprocarpus	July 3.
bufonius ...	bud May 22.
Luzula	
pilosa	Mch. 27th, J.A.
campestris ...	full May 3.
multiflora ...	May 3.
Alisma	
plantago	Jn.26(Binck knoll), July 1, H.W.T.
Triglochin	
palustre	June 19.
Typha	
latifolia	July 3, F.E.T.
Sparganium	
ramosum.....	June 26.
simplex	July 3.
Sagattaria	
sagittifolia ...	July 3rd, G.W.D.L.
Arum	
maculatum ...	full May 3.
Eleocharis	
palustris	May 22, W.M.H.M.
Scirpus	
lacustris	June 21, F.E.T.
Carex	
muricata	June 1.
divulsa.....	May 16th, M. & H.
vulpina	bud May 17.
paniculata ...	full May 17.
præcox.....	May 5th, M. & H.
disticha	June 5, (full).
glauca	full May 3.
sylvatica	May 15, F.W.F.
hirta	by May 22.
paludosa	May 3.
riparia.....	[May 16, M. & H.]
ampullacea...	full June 1.
Phalaris	
arundinacea	June 5th.
Anthoxanthum	
odoratum ...	full May 3.
Phleum	
pratense	June 12.
Alopecurus	

pratensis ..... full May 3.
geniculatus ... June 5, W.M.H.M.
agrestis ..... May 17, (Woodborough).

Milium
effusum ..... May 15, G.W.D.L.

Agrostis
vulgaris ..... June 19.

Holcus
lanatus ..... May 26, G.W.D.L.
mollis ..... July 1.

Aira
præcox..... bud May 13.
cæspitosa ... June 5.

Trisetum
flavescens ... June 1.

Avena
pratensis ..... May 17.
pubescens ... May 13, G.W.D.L.

Arrhenatherum
avenaceum ... June 1.

Kœleria
cristata ..... May 15.

Melica
uniflora ..... Jn. 12 (full), [May 16, M. & H.]

Poa
annua ..... all the year.
nemoralis ... full July 3, F.E.T.
trivialis ..... May 17th (Woodborough).
pratensis..... full May 3.

Glyceria
aquatica ..... June 19, F.E.T.
fluitans ..... May 22.
plicata..... May 22.

Briza
media ..... May 17, (Woodborough).

Cynosurus
cristatus ..... June 1.

Dactylis
glomerata ... May 17, (Woodborough).

Festuca
sciuroides ... full June 24.
ovina ..... May 17, (Woodborough); [May 16, W.M.H.M.]
rubra ..... May 17.
gigantea ..... June 26.
pratensis..... June 1.
loliacea ..... June 19.
arundinacea June 5.
elatior ..... full June 24.

Brachypodium
sylvaticum ... June 24.
pinnatum ... full June 26.

Bromus
erectus ..... by May 3.
asper ..... June 12.
sterilis..... by May 3.

Serrafalcus
commutatus June 19 (full
mollis ..... full May 3.
racemosus ... May 22.

Triticum
caninum ..... June 1.
repens ..... June 5.

Hordeum
pratense ..... full July 3.

Lolium
perenne ..... May 15, G.W.D.L.

Equisetum
arvense ..... full May 3.
limosum ..... May 16, M. & H.
palustre ..... May 17, (Woodborough)

Botrychium
Lunaria ..... May 6, F.W.F.

Ophioglossum
vulgatum ... full May 13, F.W.F.

Rye .... May 15, G.W.D.L.

NEW SPECIES AND OTHER NOTICES.

Myosurus minimus—This species was over unusually early.

Diplotaxis muralis—Found by H.W.T. at Binck-Knoll.

Viola canina—White varieties have been found in Savernake Forest.

Polygala calcarea—Detected by J.F.D. at Martinsell.

Polygala oxyptera—ditto.

Polygala depressa—This species has been found before, as a dried specimen in the Herbarium, labelled *P. vulgaris*, turns out to be *P. depressa*. But besides this, an uncommon form of this species was found by J.F.D. at Martinsell, and sent to Dr. Boswell for identification. In reply he states "I think your doubtful Polygala must be called *depressa*. Usually *depressa* produces slender subterranean stolons, much as *Viola lactea* does, but this year I found it in a place where the "whins" had been burnt, and where the ground was hard and bare, with no subterraneous shoots, and quite like your Wilts plant."

Cerastium triviale var *pentandrum*—Found at Martinsell by J.F.D.

Mœnchia erecta—One specimen only has been found about Marlborough before this year. It was found in abundance in Savernake Forest by G.W.D.L.

Genista tinctoria—Found at Binck-Knoll by H.W.T.

Trifolium medium—Binck-Knoll.

Lathyrus sylvestris—Binck-Knoll. F.E.T.

Sanguisorba officinalis—Binck-Knoll. H.W.T.

Œnanthe fistulosa—Binck-Knoll. G.W.D.L.

Torilis nodosa—Binck-Knoll. H.W.T.

Galium tricorne—Woodborough and Binck-Knoll.

Achillea Ptarmica—Binck-Knoll. H.W.T.

Serratula tinctoria—Binck-Knoll. H.W.T.

Lactuca muralis—White Horse Down. W.M.H.M., & F.G.H.

Polygonum Bistorta—West Woods. G.W.D.L., and Mildenhall.

Triglochin palustre—has re-appeared at Mildenhall after some years absence.

Typha latifolia—Binck-Knoll. F.E.T.

Carex muricata—not uncommon.

Aira præcox—Savernake Forest.

Festuca sciuroides—West Woods.

Festuca elatior—Binck-Knoll.

Brachypodium pinnatum. Binck-Knoll.

We have thus added 12 new species to our List.

THE ORIGIN AND CAUSES OF THE BELIEF IN APPARITIONS, WHETHER NATURAL OR SUPERNATURAL.

The following Paper, read by A. BABINGTON, Esq., was unavoidably omitted from the last Report.

I BELIEVE it was Dr. Johnson who once declared his belief in ghosts, on the ground that a fact which had been believed throughout all ages by a large majority of the human race, must have a foundation in reality. What the value of this argument may be, I shall not stop to enquire. But this much at least is certain, that the statistics on which it is based are incontestable. From the earliest dawn of historical knowledge down to our own day, from the ignorant savage, who ranks lowest in the scale of mankind, to the accomplished scientific enquirer of our own country, the belief in the reality of supernatural apparitions has been uniform and unbroken. A phenomenon so remarkable, even if it be not a conclusive proof of the reality of those apparitions (and on this point I shall give no opinion), is at least a sufficient cause for some examination into the sources of so wide-spread a belief. In the few hints which I have hastily put together, I can pretend to do nothing more than furnish a clue for those among you who may be desirous of carrying your investigations further. And I shall only promise (what indeed will be sufficiently evident from the course of my paper) that I cannot claim to have exhausted one half of the theme which I have selected.

If we go back to the primeval races which have lived upon each of the great continents of our globe, the savages of Asia, Africa, Europe, and America, we shall find that the belief in the reality of supernatural apparitions has been no less marked than the belief in religion, or the objects of religious worship. It is the pledge and the assurance in their eyes of the idea which seems to be deepest rooted in human nature, that something of man survives in one form or another after death. Among savages the general conception seems to be that the spiritual apparition bears the likeness of its fleshly body. It is habitually taken for granted by savages that souls set free from the earthly body are recognized by a likeness to it which they still retain, whether as ghostly wanderers on the earth, or inhabitants of the world beyond. Nay, this view of the departed spirit may be traced through the masterpieces of ancient literature, to the writers of our own day. Ulysses, in the Odyssey, recognises Tiresias by the sceptre which he bears; Orion, by the club which

he wields; and Hercules, by the bow which he draws. Æneas, in Virgil's Epic, describes the leaders of the Danai and the Agamemnonian phalanxes, by the shadowy spears which they hurl, and the shadowy chariots which they guide. In Shakespeare's great tragedy, Horatio thus describes the ghost of Hamlet's father:—"Such was the very armour he had on, when he the ambitious Norway combated; so frowned he once when in an angry parle he smote the sledded Polacks on the ice." "Man's spirit," says the mystical Swedenborg, "is his mind which lives after death in complete human form." And the same thought has been repeated by a living poet—"Eternal form shall still divide the eternal soul from all beside; and I shall know him when we meet." But a special group of quaint superstitions will serve to display the thoroughness with which among savage nations the soul is regarded as an image of the body. It is argued, for instance, that the mutilation of the body will have a corresponding effect upon the soul, and even very low savage races have worked out this idea. Thus, it was recorded of the Indians of Brazil by one of the early European visitors, that they believe that the dead arrive in the other world wounded or hacked to pieces, in fact just as they left this. Thus, too, the Australian, who has slain his enemy, will cut off the right hand of the corpse, so that although the spirit will become a hostile ghost, it cannot throw with its mutilated hand the shadowy spear, and it may be safely left to wander, malignant, but harmless. The Negro's theory of the mutilation of the soul together with the body could not be brought out more vividly than in the hideous story of the West Indian planter, whose slaves began to commit suicide in order to obtain relief from their present misery, and restoration to their native land. But their master effectually put a stop to this practise by cutting off the heads and hands of the corpses. The survivors resigned in despair all hope of escape from the power of a master, who could not only make their lives wretched in this world, but could even maim their souls in the world to come.

Before going further, it is interesting as well as amusing to notice the theory by which the chemists of the 17th century attempted to account for apparitions. They imagined that by the process of Palingenesy (as it was called) they could re-produce the rose, or any other plant from its ashes. The saline residuum of the flower, mixed with a certain substance, was exposed to a gentle heat, and from the midst of its ashes there arose, in all its native beauty, the stem, the leaves, and the corolla of the plant. From this fanciful result, the reality of which was positively avouched by the alchymists, the real origin of apparitions was speedily deduced. As the saline particles of each part of the plant were supposed, in virtue of their specific affinities, to resume their places in its resuscitated phantom, so it was imagined that the saline particles of the human body, liberated by decomposi-

tion, were exhaled from its earthly tenement, and resumed in a shadowy outline the same position which they had held in the living frame.

This explanation of ghosts was in perfect harmony with the speculations of the age; but even in those times an appeal was occasionally made to experiment, and the chemical magician experienced no difficulty in extricating felons from the soil of the church-yard, or in causing the shade of the executed felon to hover above his pounded bones. In the time even of Louis the XIV these experiements were believed to have been successfully performed. One experiment was made on the body of a malefactor, and the following account of it, given by Dr. Ferrier, is an abstract of one which appeared at the time—"A malefactor was executed, of whose body a grave physician got possession for the purpose of dissection. After disposing of the other parts of the body, he ordered his assistant to pulverize part of the cranium. The powder was left in a paper on the table of the museum where the assistant slept; about mid-night he was awakened by a noise in the room, which obliged him to rise immediately. The noise continued about the table without any visible agent; and at length he traced it to the powder, in the midst of which he now beheld, to his unspeakable dismay, a small head, with open eyes, staring at him; presently two branches approached, which formed into arms and hands; then the ribs became visible, which were soon clothed with muscles and integuments; next the lower extremities sprouted out, and when they appeared perfect, the puppet (for his size was small) raised himself on his feet; instantly his clothes came upon him, and he appeared in the very cloak he wore at his execution. The affirighted spectator, who had hitherto been mumbling his prayers with great application, now thought of nothing but making his escape from the revived ruffian; but this was impossible, for the apparition placed himself in his way, and after divers fierce looks and threatening gestures opened the door and went out."

This theory of apparitions, the only one which seemed perfectly intelligible to the wisdom of the age, rose high in popular estimation, and was supported by a very respectable constituency, even in England. Dr. Webster, in his book on witchcraft, not only sanctioned it with his express approbation, but brought forward new evidence in its support. He considered the regeneration of plants from their ashes as established by the ocular testimony of Borelli, Kircher, and others, who, he says with charming simplicity, "Would have been ashamed to affirm it were it not true," and he concludes that it is not only possible, but rational, that animals, as well as plants, have their ideas, or figures, or actual shapes existing after the gross body is destroyed. Hence, he argues—"Since the shapes and apparitions of men do appear, it necessarily follows that their corporeal souls do exist apart, and attend upon, or are near the blood and bodies."

I suppose that you will be scarcely more disposed than myself to assent to this chain of reasoning. Let me, then, pass on to consider some of the natural causes by which apparitions may be explained.

First in this class we may place the apparitions which are produced by artificial agencies. These optical delusions may be traced back to an early period of antiquity. The properties of lenses and concave mirrors, and especially that of forming images in the air, which eluded the grasp of the observer, and possessed all the characters of an incorporeal existence, were certainly known to the ancient magicians. Hence it was easy to obtain from inverted and highly illuminated statues and pictures, aerial representations of their gods, or of their departed friends. But though such apparitions had the requisite resemblence to their prototypes, they still wanted the reality of life. This defect, however, they were able to supply. They possessed the art of giving an erect position to inverted images, so that from living beings it was easy to exhibit erect apparitions in the air. Persons who resembled their divinities, or the individuals whose apparitions were required, were no doubt dressed in appropriate attire, so as to furnish aerial images, exhibiting all the expressions and repeating all the movements of the original objects. We find an instance of this during the ninth century of the Christian era. The Emperor Basil, being inconsolable for the loss of a favourite son, had recourse to the prayers of Theodore, Archbishop of the Euchaites, who had long been celebrated for possessing the gift of miracles. The Emperor required a parting glimpse of his child; the prayers of the Archbishop were heard; the disconsolate father was indulged with the sight of his son, arrayed in a magnificent dress, and mounted on a superb charger. The apparition advanced to the Emperor, threw itself into his arms, and vanished. It is impossible to suppose that a real horseman was on this occasion the instrument of deception. The disappearance of the apparition in the arms of Basil, exactly after the manner of a phantasmagoric image, clearly indicates that it must have been an optical delusion, and proves that the aerial image either of a portrait, or of a living youth resembling the deceased prince, was the evanescent spectre which the father vainly pressed to his heart.

Let me pass on to a second cause. Optical delusions may be produced without artificial means by a remarkable combination of objects seen in a dim light, and worked up by an excited imagination into the semblance of an apparition. The following story in illustration of this is told by Dr. Ferriar. A gentleman was benighted while travelling alone, in a remote part of the Highlands of Scotland, and was compelled to ask shelter at a small lonely hut. When he was to be conducted to his bedroom the landlady observed with mysterious reluctance that he would find the windows very secure. On examination, part of the wall appeared to have been broken down to enlarge

the opening. After some enquiry he was told that a pedlar who had lodged in the same room a short time before had committed suicide and was found hanging behind the door in the morning. According to the superstition of the country it was deemed improper to remove the body through the door of the house, and to convey it through the window was impossible, without removing part of the wall. Some hints were dropped that the room had been subsequently haunted by the poor man's spirit. The gentleman laid his arms, properly prepared against intrusion of any kind, by the bedside, and retired to rest, not without some degree of apprehension. He was visited in a dream by a frightful apparition, and, awaking in agony, found himself sitting up in bed, with a pistol grasped in his right hand. On casting a fearful glance around the room, he discovered by the moonlight, a corpse dressed in a shroud, reared erect against the wall, close to the window. With much difficulty he summoned up resolution to approach the dismal object, the features of which and the minutest parts of its funeral apparel, he perceived distinctly. He passed one hand over it, felt nothing, and staggered back to the bed. After a long intercourse and much reasoning with himself, he renewed his investigations, and at length discovered that the object of his terror was produced by the moon-beams, forming a long bright image through the broken window, on which his fancy, impressed by his dream, had pictured with mischievous accuracy, the lineaments of a body prepared for interment.

This leads me to a third cause. For apart from any optical delusion whether voluntary or involuntary, a supposed apparition may be naturally explained by a mistake arising from an unexplained coincidence Take the following as an example. A club of persons connected with science and literature, was formed at Plymouth. During the summer months, the society met in a cave by the sea-shore; during the autumn and winter months, they assembled within the premises of a tavern, but, for the sake of privacy, had their meetings in a summer-house situated in the garden, at a distance from the main building. Some of the members, whose houses were situated in a particular quarter of the town, possessed a pass-key to the garden door, by which they could enter the garden and reach the summer-house without the publicity or trouble of passing through the open tavern. Now it was the rule of this club that its members presided in turn. On one occasion, during the winter session, the president of the evening happened to be seriously ill; nay more, it was reported that he was on his death-bed. The club met as usual, and, from a feeling of respect, left vacant the chair which he would have occupied if he had been present. As was natural, the conversation turned upon the illness of the president, his remarkable abilities, and the loss which the society would sustain in the event of his death. While they were discussing this melancholy subject, the door suddenly opened, and the absent

President entered the room. He wore a white cloth wrapped around his forehead, on which the cold dews of death seemed already to have gathered. He stalked into the room with unusual gravity, took the place which had been left vacant for him, lifted the empty glass which stood before him, bowed to the awe-struck spectators, and put it to his lips; then replaced it on the table and left it as he had entered it, in profound silence. The company were appalled at this hideous spectacle. At length, after many observations on the strangeness of what they had seen, they resolved to despatch two of their number as ambassadors, to see how it fared with the President who had thus strangely appeared amongst them. They went, and returned with the frightful intelligence that the friend after whom they had enquired, had died that very evening.

The astonished party then resolved that they would remain absolutely silent respecting the wondrous sight which they had seen. What! a philosophical society pander to a vulgar superstition by acknowledging that they had seen a ghost? never! perish the whole fabric of inanimate nature rather than such a confession of human weakness should be wrung from philosophical lips! The affair was therefore kept a profound secret, and this secrecy was regarded as a point of honour. Several years afterwards, an old woman who had long filled the place of a sick-nurse, was taken very ill and on her death-bed was attended by a member of the philosophical club. To him with many expressions of regret, she acknowledged that she had long before attended Mr. Jones (naming the President, whose appearance had surprised the club so strangely) and that she felt distress of conscience on account of the manner in which he had died. She said that as his malady was attended by light-headedness, she had been directed to keep a close watch upon him during his illness. Unhappily she fell asleep, and during her sleep the patient woke up and left the room. When on her awaking she found the bed empty and the patient gone, she forthwith hurried out of the house to seek him, and met him in the act of returning. She got him replaced in bed, but it was only to die there. She added, to convince her hearer of the truth of what she said, that immediately after the poor gentleman had breathed his last, a deputation of two members from the club came to enquire after their president's health, and received for answer that he was already dead. This confession explained the whole matter. The delirous patient had very naturally taken the road to the club, from some recollections of his duties for the night. In approaching and retiring from the room where the club met, he had used one of the pass-keys already mentioned which enabled him to take a short cut. On the other hand, the gentlemen sent to enquire after his health, had reached his lodgings by a more circuitous road; and thus there had been time for him to arrive at his chambers long before they had been able

to do so. The philosophical witnesses of this strange scene were now as anxious to spread the story as they had formerly been to conceal it, since it not only showed in what a remarkable manner men's eyes might turn traitors to them, but at the same time proved with a triumphant conclusiveness, which infused a glow into every philosophic mind, the incontestable victory of enlightenment and reason over the base terrors of a degrading superstition.

Let me now turn to a fourth cause. The phenomenon of somnambulism occasionally lend their aid in creating a belief in the reality of apparitions. During a disturbed and excited sleep the somnambulist beholds a phantom, with such intense vividness that he imagines the dream to possess an objective reality, and positively affirms the next morning that it is an actual ghost which has appeared before him. The following story will serve as an example. The captain of a large merchant vessel in the Lisbon trade, on one occasion, when his ship was lying in the Tagus, was put to great anxiety and alarm, by the following incident, and its consequences. One of his crew was murdered by a Portuguese assassin, and the report arose that the ghost of the slain man haunted the vessel. Sailors are generally superstitious, and the fellow-sailors of the murdered man became so unwilling to remain on board the ship, that it was probable they might desert, rather than return to England, with the ghost for a passenger. To prevent so great a calamity the captain determined to examine the story to the bottom. He soon found that though all pretended to have seen lights, and heard noises, and so forth, the weight of the evidence lay upon the statement of one of his own mates, an Irishman and a Roman Catholic, who (as the Captain supposed) could have no reason for wilfully deceiving him. He affirmed to the captain, with the deepest obtestations, that the spectre of the murdered man appeared to him almost nightly, took him from his place in the vessel, and, according to his expression, worried his life out. He made these communications with a degree of horror, which intimated the reality of his distress and apprehensions. The captain, without any argument at the time, privately resolved to watch the motions of the ghost-seer in the night. As the ship-bell struck twelve, the sleeper started up with a ghastly and disturbed countenance and lighting a candle, proceeded to the galley or cook-room of the vessel. He sat down with his eyes open, staring before him as on some terrible object, which he beheld with horror, yet from which he could not withhold his eyes. After a short space he arose, took up a tin can, filled it with water, muttering to himself all the while, mixed salt in the water and sprinkled it about the galley. Finally, he sighed deeply, like one relieved from a heavy burden, and returning to his hammock slept soundly. The next morning the haunted man told the usual precise story of his apparition, with the additional circumstances, that the ghost had led him to the galley, but that he had

fortunately, he knew not how, obtained possession of some holy water, and succeeded in getting rid of his unwelcome visitor. The visionary was then informed of the real transactions of the night with so many particulars as to satisfy him that he had been the dupe of his imagination; he acquiesced in the Captain's reasoning, and the dream, as often happens in these cases, returned no more after its impostyre had been detected.

I may add that this confusion between a sleeping and a waking vision has furnished Dickens with the framework of one of his charming Christmas stories.

But fifthly, extreme mental agitation, the agitation of fear, or anxiety, or a troubled conscience will sometimes call up the semblance of an apparition, which really is the false creation of the heat-oppressed brain. It is in this way that Shakespeare apparently means us to understand the fine scene where the ghost of Banquo appears to Macbeth while he is carousing with the Scottish Lords. It is in this way probably that we may explain the celebrated historic instance of an apparition,—the ghost of Cæsar appearing to Brutus in his tent and warning him that they shall meet again at Philippi. There is, however, one authenticated story of this nature, which (owing to the collateral evidence of a witness, other than the ghost-seer) puts the question beyond a doubt. Those who are unacquainted with the "Ingoldsby Legends" will find the story there in a practical form under the title of "Dead Drummer." The story in plain prose is as follows: Jarvis Matcham was pay-serjeant in a regiment, where he was so highly esteemed as a steady and accurate man that he had the opportunity of embezzling a considerable part of the money lodged in his hands for the pay of the soldiers, and bounty of recruits, and other charges which fell within his duty. He was summoned to join his regiment from a town where he had been engaged on the recruiting service, and the manner of his summons led him to believe that he had fallen under suspicion. Perceiving that discovery was at hand he would have deserted had it not been for the presence of a little drummer boy, who was the only one of his party appointed to attend him. In the desperation of his crime he resolved to murder the boy, and avail himself of the balance of the money in his possession to make his escape. He formed this plan the more readily because he believed that the drummer had been set as a spy on his actions. After committing the murder he changed his dress, made a long walk across the country to an Inn on the Portsmouth road and engaged a bed there, desiring to be called when the first Portsmouth coach came. The waiter called him accordingly, but long after remembered that the first words the stranger uttered on awaking were:—"I did not kill him." Matcham went to the sea-port by the coach, and entered the navy as an able-bodied mariner. His sobriety and attention to duty gained him the same good opinion of the

officers in his new service as he had enjoyed in the army. He was afloat for several years, and behaved remarkably well in several actions. At length the vessel came into Plymouth, was paid off and some of the crew (amongst whom was Jarvis Matcham) were dismissed as too old for further service. He and another seaman resolved to walk to town, and took the road through Salisbury. It was when within two or three miles of that city that they were overtaken by a sudden tempest, accompanied by lightning unnaturally vivid, and thunder unnaturally loud. Matcham expressed more terror than seemed natural in one who was familiar with storms, and began to look and talk so wildly that his companion became aware that something more than usual was the matter. At length Matcham complained to his companion that the stones rose from the road and flew after him. He desired the man to walk on the other side of the highway to see if they would follow him when he was alone. The sailor complied, and Matcham complained that the stones still flew after him and did not pursue the other. "But what is worse," he added, coming close up to his companion, "who is that little drummer-boy, and what business has he to follow us so closely?" "I can see no one," answered the seaman infected by the superstition of his associate. "What! not see that little boy with the bloody trousers?" exclaimed Matcham. His comrade was by this time so terrified that he besought him to make a clean breast of it if he had anything that weighed on his conscience. The criminal uttered a deep groan, and declared that he was unable longer to endure the life which he had led for years. He then confessed the murder of the drummer, and added that, as a considerable reward had been offered, he wished his comrade to deliver him up to the magistrates of Salisbury; for he should like an old shipmate to profit by his fate which he could now no longer escape. Having overcome his friend's objections to this mode of proceeding Matcham was delivered up to justice, and made a full confession of his guilt. But before the trial the love of life returned. The prisoner denied his confession and pleaded "not guilty." By this time, however, full evidence had been procured from other quarters. Witnesses appeared from his former regiment to prove his identity with the murderer and deserter, and the waiter remembered the ominous words which he had spoken when he awoke him to join the Portsmouth coach. Matcham was accordingly found guilty. When all chance of a respite was hopeless, he repeated his previous confession, and with his dying breath insisted on the reality of the vision which he had seen on Salisbury Plain.

I have now arrived at the sixth of the natural causes for apparitions; and this is incontestably the most important and interesting. Let me begin by giving several instances.

I. Captain Campbell was a native of England, but bred in the Irish Brigade. He was a man of the most dauntless courage, which he displayed in some desperate adventures during the first year of the French Revolution. He was by creed a Roman Catholic, and his confessor was a clergyman who was residing as chaplain to a man of rank in the west of England, about four miles from the place where Captain Campbell lived. On riding over one morning to see this gentleman he had the misfortune to find him suffering from a very serious complaint. He retired in great distress, and the feeling brought back upon him many other painful and disagreeable recollections. These filled his thoughts till the hour of going to bed, when to his great astonishment he saw in the room the figure of his absent confessor. He addressed it, but received no answer. Determined to push the matter to an issue, Captain Campbell advanced on the phantom, which appeared to retreat gradually before him. In this manner he followed it round the bed, when it seemed to sink down on an arm-chair, and remain there in a sitting posture. To ascertain positively the nature of the apparition the soldier himself sat down on the same chair, ascertaining thus, beyond question, that the whole was an illusion. He then undressed himself, the ghost now standing before him. On Captain Campbell's rising, the ghost retreated, and finally passed behind the curtains into bed, when Campbell turned in after him.

This you will observe, was an isolated apparition which was not repeated. The second case is somewhat different.

II.—A patient of Dr. Gregory, an eminent physician who practised at Edinburgh, demanded a consulation with the doctor, and made the following extraordinary statement of his complaint. "I am in the habit" (he said) "of dining at five, and exactly as the hour of six arrives, I am subjected to the following painful visitation. The door of the room, even when I have been weak enough to bolt it, which I have sometimes done, flies wide open; an old hag enters with a frowning and incensed countenance, comes straight up to me with every demonstration of spite and indignation; rushes upon me; says something, but so hastily that I cannot discover the purport, and then strikes me a severe blow with her staff. I fall from my chair in a swoon which is of longer or shorter endurance. To the recurrence of this apparition I am daily subjected." The doctor immediately asked his patient whether he had invited anyone to sit with him when he expected this strange visitor. The patient replied in the negative. The nature of the complaint (he said) was so singular, it was so likely to be imputed to fancy or even to mental derangement, that he had shrunk from communicating the circumstances to anyone. "Then" (said the doctor) "with your permission, I will dine with you to-day tête-a-tête, and we will see if your malignant old woman will venture to join our company." The

patient accepted the offer with hope and gratitude, for he had expected ridicule rather than sympathy. At dinner Dr. Gregory who suspected some nervous disorder, exerted his powers of conversation, well known to be of the most varied and brilliant character, to keep the attention of his host engaged, and prevent him from thinking of the approach of the fatal hour, to which he was accustomed to look foward with so much terror. He succeeded in this purpose better than he had hoped. The hour of six came almost unnoticed, and, it was hoped, might pass away without any recurrence of the vision; but it was scarce a moment struck when the host exclaimed in an alarmed voice;—"The hag comes again!" and dropped back in his chair in a swoon in the way he had himself described.

Anyone who cares to see this idea presented in an objective form and most ingeniously worked into the plot of a novel, will find it in that treasure-house of the marvellous and supernatural, Bulwer Lytton's novel "Zanoni." But for our present object I would ask you to observe that in this case the apparition was not isolated but repeated, and that it recurred, not at any hour, but at a fixed period of the day.

III.—The third instance which I shall give you is one which Sir David Brewster has recorded at full length. A lady, whom for convenience sake we will call Mrs. Williams, saw in the course of eighteen months no fewer than thirteen apparitions. Seven of those happened when she was alone, four when she was with her husband and two when she was in the company of friends. Minute accounts of all these are given by Sir David Brewster from the communications of the lady's husband who appears to have been one of his personal friends, and of whom he says that if he were permitted to mention his name, his rank in society, and his eminence in the scientific world, the most sceptical reader would be satisfied that the case had been philosophically as well as faithfully described. He adds that the lady, from her previous knowledge of the subject, watched her own case from its commencement as one of spectral illusion, and was never induced to misinterpret her perceptions by any superstitious fears or to exaggerate them by any love of the marvellous. The phenomena, therefore, which she saw and described have all the value of scientific facts. I shall not give the account at full length, but select two or three of the most striking apparitions.

(a). One evening when Mrs. Williams was going to bed she was arranging her hair at the dressing-glass previously, and was suddenly startled by seeing over the left shoulder in the mirror the figure of a near relative who was then out of England. It was dressed in grave-clothes closely pinned round the head and under the chin. The eyes were open and met hers in the glass, but the features were solemn and rigid. After a few minutes she turned round

to look for the reality over her shoulder, but it was not to be seen and had also disappeared from the mirror. Mrs. Williams felt herself at this time listless and drowsy from having taken a fatiguing drive during the day.

(*b*). A month after this when Mrs. Williams had dismissed her maid previous to going to bed, she perceived in a large easy chair before her, the figure of a departed friend, her own sister-in-law. The figure was dressed with great neatness, as was usual with her, but in a gown of a peculiar kind, such as Mrs. Williams had never seen her wear, but exactly such as had been described to her by a common friend as having been worn by her sister-in-law during her last visit to England. She noticed particularly the air, dress, and appearance of the figure, which sat in an easy attitude with a handkerchief in one hand. She felt a difficulty when she tried to speak to the apparition, and in about three minutes it disappeared. She experienced on this occasion a strange sensation in the eyes which seemed to be relieved when the vision was over.

(*c*). A few months later, about two o'clock in the afternoon when Mrs. Williams was sitting near the window at her husband's side, he heard her exclaim "what have I seen!" and upon looking at her he perceived a strange expression in her eyes and countenance. A carriage and four had appeared to be driving up the entrance road to the house; as it approached, she felt inclined to go upstairs to prepare to receive company, but, as if spell-bound, she felt herself unable to speak or to move. When the carriage arrived within a few yards of the window, she saw the figures, the positions and the persons inside take the ghastly appearance of skeletons and other hideous figures. The whole scene then vanished, and she made the exclamation above mentioned.

(*d*). About six weeks later, at nine o'clock in the evening, when Mrs. Williams and her husband were reading in the drawing-room, he felt a pressure on his foot, and upon looking up he observed Mrs. Williams' eyes fixed with a strong and unnatural stare upon a chair about ten feet distant. He enquired what she saw, whereupon the expression of her countenance changed, and when she had recovered herself, she told him that she had seen his brother, who was then alive and well in London, seated in the opposite chair, dressed in grave-clothes, but with a ghastly countenance as if scarcely alive.

These instances will suffice, but I may add that as Mrs. Williams was aware of the interest which her case would excite, she made several careful observations on the phenomena which she had beheld. The following are the most important which compelled her to gaze on the apparitions.

(1).—Some of the spectres were seen in bright day-light, and she confidently states that they were as vivid as the reality and had all the brightness of colouring which characterises external objects. (2). She experienced a sort

of fascination. On two occasions she found herself unable to speak or move, as if spell-bound; and on another she could only indicate her condition to her husband by pressing his foot. (3). During the existence of the illusion there was always a strange expression in her eyes and countenance. On one occasion her eyes were fixed on the spectre with a strong unnatural stare; and when it disappeared her countenance resumed its usual expression. (4). After having been subject to seven of these illusions, Mrs. Williams described to her husband "a peculiar feeling in the eyes as preceding these visions for some hours, this sensation appearing to be relieved when the vision was over."

IV.—The fourth instance which I shall give you is perhaps the most remarkable of all. Nicolai was a bookseller and a publisher in Berlin at the close of the last century. He attained to considerable literary eminence as one of the leaders of the celebrated Aufklärungs Zeit or Illumination-epoch, and was a contemporary of the brilliant coterie which comprised in its ranks Shelling, Moses Mendelssohn, Schleirmacher, Goethe, Herder, the Schlegels and others. The account of his illusions was communicated by himself to the Prussian Academy of Sciences. Towards the end of the year 1790 and the beginning of 1791 Nicolai had been agitated by various misfortunes which preyed deeply upon his mind, and on the 24th February an event occurred which distressed him greatly. About 10 o'clock in the morning when his wife and a friend had entered his room for the purpose of consoling him, he suddenly perceived at the distance of a few paces the figure of a deceased friend, which remained from seven to eight minutes and which the rest of the company were of course unable to see. A little after four o'clock in the afternoon the same figure appeared to him when he was alone; he went to his wife's apartment to mention this to her, and the apparition accompanied him to it alternately vanishing and reappearing. Soon after six o'clock on the same day several moving figures made their appearance all of them unconnected with the one which he had previously seen. When his mind had become more composed and his bodily indisposition had been removed by medical treatment Nicolai expected that these apparitions would take leave of him. His expectations, however, were disappointed, for they increased in number and underwent the most extraordinary transformation. The first figure which had appeared to him never appeared again, though several other figures occupied its place. These figures for the most part represented persons whom he did not know, though sometimes his acquaintances appeared in this spectral form. The figures of persons who were alive occurred more frequently than those of persons who were dead, and he distinctly remarked that the friends with whom he daily conversed never came before him in a spectral form. Nor when he

endeavoured by an act of will to summon them before him, did he ever succeed in the attempt.

When these apparitions formed the subject of his conversation with his medical attendant and his wife, they sometimes left him altogether and re-appeared singly or in groups. The apparitions generally represented persons of both sexes, who passed to and fro, as though unconnected with each other. Sometimes they appeared on horseback accompanied by dogs, the colours in all cases being the same as in actual life, though occasionally paler in hue.

When the apparitions began to come more frequently and in greater numbers, Nicolai began also to hear them speak: sometimes they addressed one another, but generally they spoke to himself in short speeches which never contained anything disagreeable. This inclination to friendly conversation seemed to possess the apparitions most frequently when he was alone; sometimes, however, he heard their voices in society blending with the conversation of the company.

Although these visionary beings had ceased to affect him with unpleasant emotions, yet as his complaint was unmistakeably on the increase, and as the figures had appeared to him for whole days together, nay, even when he awoke at night, he found it necessary to apply leeches. This was done at eleven o'clock in the morning. After the application of the leeches, while he was sitting alone with the surgeon, the room swarmed with human forms of every description which crowded fast upon one another till half-past four o'clock. The figures then began to move more slowly, their colours became gradually paler, and after intervals of seven minutes, he could distinguish a palpable diminution in their intensity, without any change in the distinctness of their figures. At about half-past six they became perfectly white, and moved very slightly; their forms, however, were still perfectly distinct, and without decreasing in number they gradually became less perceptible. Instead of moving off or vanishing as they had usually done, they now dissolved immediately into air. About eight o'clock not a vestige of them remained; and what is most noteworthy, they never appeared again.

Nicolai took great interest in investigating these marvellous phenomena, and the following are the most interesting of the observations which he has recorded on the subject: (i) he endeavoured to discover if the figures were summoned before his vision through association with his previous thoughts, and though he sometimes thought that he had discovered some such association, yet he assures us that on the whole he could trace no connection between the apparitions and the state of his mind, or the nature of his employments, or the thoughts which occupied his attention: (ii) he found that he could always distinguish the phantoms from real figures, and he never once made a mistake

in drawing this distinction. "I knew extremely well" (he says) "when it only *appeared* to me that the door opened, and the phantom entered, and when the door was *really* opened and some one came in." (iii) The appearance of phantoms was in every case involuntary, and depended little if at all upon external circumstances. They were equally distinct, whether he was alone or in society, whether he was in his house or a neighbour's; and what is most remarkable, they were no less plain in darkness than in broad daylight. He observed, however, that they were less frequent in other houses than in his own; and they very seldom appeared when he walked in the public streets. I hope I have not quite exhausted your patience by the length at which I have recorded these two cases. But they are so remarkable that I felt I could scarcely pass them over with a briefer notice. Let me proceed to make one or two remarks upon them. In both these cases the apparitions had their immediate origin in bodily indisposition. Both of these subjects suffered from a disorder of the digestive organs. In the case of Nicolai it occasioned giddiness! In the case of Mrs. Williams a peculiar affection, or tightness, as it were about the head, shewing clearly that there was a determination of blood to the region of the brain. The spectres of Nicolai generally appeared when digestion began and they vanished upon the application of leeches. Mrs. Williams was obliged to take a daily tonic, and her apparitions seem on several occasions to have been produced when she was prevented from having recourse to it. In their mental character, too, there was considerable resemblance between Nicolai and Mrs. Williams. The former possessed a lively and active imagination, and he had a peculiar facility in presenting to his mind in the distinctest manner the figures, the dress, the features, and the complexion of characters in novels or plays which he had already sketched out. Between waking and sleeping, pictures of every description, and often of the strangest forms, presented themselves to him, now changing their shapes and now disappearing; and he informs us that when he either thought deeply or wrote attentively, thoughts occurred to his mind which had often no connection with the subjects before him, and which were frequently so vivid that they seemed as if expressed in actual words. So too Mrs. Williams (to quote her husband's expressions) had a naturally morbid imagination, so strongly affecting her corporal impressions, that the story of any person having suffered severe pain by accident or otherwise, would occasionally produce acute twinges in the corresponding part of her person. An account for instance of the amputation of an arm would produce an instantaneous and severe sense of pain in her own arm. She was subject to talk in her sleep with great fluency, to repeat poetry very much at length, particularly when unwell, and even to cap verses for

half an hour together, never failing to quote lines beginning with the final letter of the preceding till her memory was exhausted.

From these facts it appears, that the immediate cause of spectral illusions is a disorder in the digestive organs, and by a comparison of the two cases under review, it is manifest that the duration of the illusions increases with the severity of the malady. Mrs. Williams' complaint was slight compared with Nicolai's and consequently her apparitions continued only for a few minutes, and never re-appeared after they had vanished; though distinct and vivid they were not carried about with her like those of Nicolai, and they seem to have been effaced by the act of closing the eyelids, for whenever the fixed stare was at an end the spectres disappeared.

I had written thus far when I came across a case recorded by Dr. Abercrombie, and which supplied us with an illustration of the preceding.

A gentleman of high mental endowments, now upwards of eighty years of age, has been for 10 years liable to almost daily visitations from apparitions. They in general present human countenances, the head and upper part of the body are distinctly defined, the lower parts are generally lost in a kind of cloud. The figures are various; but he recognizes the same countenances repeated from time to time, particularly of late years that of an elderly woman, with a peculiarly arch and playful expression, and a dazzling brilliancy of eye, who seems just ready to speak to him. They appear also in various dresses, such as that of the age of Louis the 14th, the costume of ancient Rome, that of the modern Turks and Greeks, but more frequently of late as in the case of the female now mentioned, in an old-fashioned Scottish plaid, drawn up and brought forward over the head and then crossed below the chin as the plaid was worn by aged women in his younger days. He can seldom recognize among the spectres any figures or countenances which he remembers to have seen; but his own face has occasionally been presented to him, gradually undergoing the change from youth to manhood and from manhood to old age. The figures appear at various times of the day, both night and morning. They continue before him for some time, and he sees them almost equally well with his eyes open or shut, in full daylight or in darkness. They are almost always of a pleasant character and he seems to count their presence as a source of amusement to him. He finds that he can banish them by drawing his hand across his eyes, or by shutting and opening his eyelids once or twice for a second or two; but on these occasions they often appear again soon after. The figures are sometimes of the size of life, and sometimes in miniature; but they are always defined and finished with the clearness and minuteness of the finest painting. They sometimes appear at a considerable distance, and gradually approach until they seem almost to touch his face. At other times they float from side

to side, or disappear in ascending or descending. In general the face of the spectre is presented to him, but on some occasions he sees the back of the head, both of males and females exhibiting various fashions of wigs and head-dresses, particularly the flowing full-bottomed wig of a former age.

I have now reached the end of the first part of my enquiry, the enquiry into the natural causes of apparitions. It will be quite clear if you have followed me in my remarks, that a vast number of apparitions which some centuries ago would have been unhesitatingly regarded as of supernatural origin, may on the contrary be explained by external facts, or by the mental or physical state of the supposed visionary. But the question still remains—do these natural causes suffice to explain *all* apparitions? or are there still some which cannot be fairly and reasonably considered to be susceptible of such an explanation? This question I had intended to discuss at length; but unfortunantely (or I should rather say fortunately) the period of time which I had at my disposal for the writing of this paper has already been exhausted, and I shall not therefore have an opportunity of testing the limits of your powers of endurance. I am however, unwilling to prove altogether faithless to the title of my paper, and I will accordingly put before you three narratives, on which such of you as feel disposed may indulge your credulity or exercise your scepticism.

The first is to be found in an article on Spiritualism contributed to the *Fortnightly Review*, by Mrs. Wallace, and may certainly claim (in the exquisite language of the *Daily Telegraph*) to furnish a startling and stupendous revelation.

For some years, a young lady, Miss Florence Cook, has exhibited remarkable mediumship, which latterly culminated in the production of an entire female form, purporting to be spiritual, and which appeared barefooted, and in white flowing robes, while she lay entranced in dark clothing, and securely bound, in a cabinet or adjacent room. Notwithstanding that tests of an apparently conclusive character were employed, many visitors, spiritualists as well as sceptics, got the impression that all was not as it should be, owing in part to the resemblance of the supposed spirit to Miss Cook, and also to the fact that the two could not be seen at the same time. Some supposed that Miss Cook was an imposter, who managed to conceal a white robe about her (although she was often searched), and who, although she was securely tied with tapes and sealed, was able to get out of her bonds, dress and undress herself, get into them again, all in the dark, and in so complete and skilful a manner as to defy detection. Others thought that the spirit released her, provided her with a white dress, and sent her forth to personate a ghost. The belief that there was something wrong, led one gentleman to seize the supposed spirit and endeavour to hold it, in the hope

that some other person would open the cabinet door, and see if Miss Cook was really there. This was unfortunately not done, but the great resemblance of the being he seized to Miss Cook, its perfect solidity, and the vigorous struggles it made to escape from him, convinced this gentleman that it was Miss Cook herself, although the rest of the company, a few minutes afterwards found her bound and sealed, just as she had been left an hour before. To determine the question conclusively, experiments have been made, within the last few weeks, by two scientific men. Mr. C. F. Varley, F.R.S., the electrician, made use of a galvanic battery, and cable testing-apparatus, and passed a current through Miss Cook's body. The apparatus was so delicate that any movement whatever was instantly indicated, while it was impossible for the young lady to dress and act as a ghost without breaking the circuit. Yet under these conditions the spirit-form did appear, exhibited its arms, spoke, wrote, and touched several persons; and this happened, be it remembered, not in the medium's own house, but in that of a private gentleman, in the West End of London. For nearly an hour the circuit was never broken, and at the conclusion Miss Cook was found in a deep trance. Since this remarkable experiment Mr. William Crookes, F.R.S., has obtained, if possible, still more satisfactory evidence. He contrived a phosphorus lamp, and armed with this was allowed to go into the dark room accompanied by the spirit, and there saw and felt Miss Cook, dressed in black velvet, lying in a trance on the floor, while the spirit form, in white robes, stood close beside her. During the evening, this spirit form had been, for nearly an hour, walking and talking with the company; and Mr. Crookes, by permission, clasped the figure in his arms, and found it to be, apparently, a real living woman.

After hearing this narrative, do you not feel disposed to exclaim in the poet's words—"Was it a vision, or a waking dream? Fled is that vision, do I wake or sleep?"

The second and third narratives are very different. This is the second. In the month of September, 1857, Captain Wilkinson, of the 6th Dragoons, went out to India, to join his regiment. His wife remained in England, residing at Cambridge. On the night, between the 14th and 15th of November, 1857, she dreamt that she saw her husband looking anxious and ill; upon which she immediately awoke, much agitated. It was bright moonlight; and looking up she perceived the same figure standing by her bedside. He appeared in his uniform the hands pressed across the breast, the hair dishevelled, and face very pale. His large dark eyes were fixed full upon her; their expression was that of great excitement, and there was a peculiar contraction of the mouth, habitual to him when agitated. She saw him even to each minute particular of his dress, as distinctly as she had ever done in

her life, and she remembers to have noticed between his hands, the white of the shirt front, unstained, however, with blood. The figure seemed to bend forwards as if in pain, and to make an effort to speak. But there was no sound. It remained visible, as she thought, for about a minute, and then disappeared. Her first idea was to ascertain if she was fully awake. She rubbed her eyes with the sheet, and felt that the touch was real. Her little nephew was in bed with her; she bent over the sleeping child, and listened to its breathings; the sound was distinct, and she became convinced that what she had seen was no dream. It need hardly be added that she did not again go to sleep that night.

Next morning she related all this to her mother, explaining her conviction that Captain Wilkinson, though she had noticed no marks of blood on his dress, was either killed or grievously wounded. So fully impressed was she with the reality of the apparition that from that time forward she refused all invitations. A young friend urged her soon afterwards to go with her to a fashionable concert, but she positively declined, declaring that uncertain as she was whether she was not already a widow, she would never enter a place of amusement until she had letters from her husband (if indeed he still lived) of later date than the 14th of November.

It was on a Tuesday in the month of December, 1857, that the telegram relating the actual fate of Captain Wilkinson was published in London. It was to the effect that he was killed before Lucknow, on the 15th of November. This news, given in the morning paper, attracted the attention of a Mr. Williams, a London solicitor, who had charge of Captain Wilkinson's affairs. When at a later period this gentleman met the widow, she informed him that she had been quite prepared for the melancholy news, but that she felt sure that her husband could not have been killed on the 15th of November, inasmuch as it was during the night between the 14th and 15th that he appeared to herself.

The certificate from the War Office, however, which it became the duty of Mr. Williams to obtain, confirmed the date given in the telegram. It ran as follows:—"War Office, 30th January, 1858. These are to certify, that it appears by the records in this Office, that Captain Wilkinson, of the 6th Dragoons, was killed in action on the 15th of November, 1857."

So matters rested, until in the month of March, 1858, the family of Captain Wilkinson received from a captain of the military train, a letter dated near Lucknow, on the 19th of December, 1857. This letter informed them that Captain Wilkinson had been killed before Lucknow, while gallantly leading his squadron; not on the 15th of November, as reported in Sir Colin Campbell's despatches, but on the 14th, in the afternoon. His friend was riding close by his side at the time when he saw him fall. He was struck

by a fragment of shell on the breast, and never spoke after he was hit. He was buried at Dilkoosha, and on a wooden cross erected at the head of his grave are cut the initals G. W., and the date of his death; on the 14th November, 1857.

The third narrative is related in a succinct manner by Dr. Mayo in his work on "popular superstitions;" and he accompanies it with the following voucher: "I have had opportunities of enquiring of two near relations of General Wynyard upon what evidence this story rests. They told me that they had each heard it from his own mouth. More recently a gentleman whose accuracy of information exceeds that of most people, told me that he had heard the late Sir John Sherbroke, the other party in the ghost story, tell it much in the same way at a dinner table." The story is as follows: In the year 1785, Sir John Sherbroke and General George Wynyard, then young men, were officers, the former Captain, the latter Lieutenant, in the same regiment, namely, the 33rd, at the time commanded by Lieutenant-Colonel Fiske, and stationed at Sidney, in the island of Cape Breton, off Nova Scotia. On the 15th of October of that year, between 8 and 9 o'clock p.m., these two officers were seated before the fire at coffee, in Wynyard's parlour. It was a room in the new barracks which had been erected in the preceding summer, and had two doors, the one opening on an outer passage, the other into Wynyard's bedroom, from which bedroom there was no exit except by returning through the parlour.

Sherbroke, happening to look up, saw beside the door which opened on the passage, the figure of a tall youth, apparently about twenty years of age, but pale and much emaciated. Astonished at the presence of a stranger, Sherbroke called the attention of his brother officer sitting near him to the visitor. "I have heard," he said, in afterwards relating the incident, "of a man being as pale as death; but I never saw a living face assume the appearance of a corpse except Wynyard's at that moment." Both remained silently gazing on the figure as it passed slowly through the room and entered the bedchamber, casting on young Wynyard as it passed a look, as his friend thought, of melancholy affection. The oppression of his presence was no sooner removed than Wynyard, grasping his friend's arm, exclaimed in scarcely articulate tones, "Great God! my brother!"

"Your brother! what can you mean?" replied Sherbroke, there must be some deception in this." And with these words he instantly proceeded into the bedroom, followed by Wynyard. But no one was to be seen there. They searched in every part, and convinced themselves that it was entirely untenanted. A brother officer, Lieutenant Gore, coming in soon after joined in the search, but equally without avail. Wynyard persisted in declaring that he had seen his brother's spirit; but for a time

Sherbroke inclined to the belief that they might have been deluded in some way or other, possibly by the trick of some brother officer. Nevertheless, at the suggestion of Lieutenant Gore, the next day Captain Sherbroke made a memorandum of the date, and all waited with the greatest anxiety for letters from England.

This anxiety at last became so apparent on Wynyard's part that his brother officers, in spite of his resolution to the contrary, finally won from him the confession of what he had seen. The story was soon noised about, and produced great excitement throughout the regiment. When the expected vessel with letters arrived there were none for Wynyard, but one for Sherbroke. As soon as that officer had opened it, he beckoned Wynyard from the room. Expectation was at its climax, especially as the two friends remained closeted for an hour. On Sherbroke's return the mystery was solved. It was a letter from a brother officer, begging Sherbroke to break to his friend Wynyard the news of the death of his favourite brother John, who had expired on the 15th of October, and at the same hour at which the friends saw the apparition in the block house.

It remains to be stated that some years afterwards, Sir John Sherbroke, who had never seen John Wynyard alive, and who had then returned to England, was walking in London when on the opposite side of the street he saw a gentleman whom he instantantly recognized as the counterpart of the mysterious visitor. Crossing over he accosted him, apologising for his intrusion, and learnt that he was a brother of the Wynyard whose apparition he had seen.

I have finished; and now what will your verdict be? will it be couched in the words of our great dramatist:

> "Why, worthy Thane,
> You do unbend your noble strength to think
> So brainsickly of things?"

Or will it rather be the echo of the Prince of Denmark's immortal world:

> "There are more things in Heaven and Earth, Horatio,
> Then are dreamt of in our philosophy?"

ON THE SOURCES OF POWER IN NATURE.

THE following Paper was read at a meeting of the Physical Section by T. O. HARDING, ESQ. :—

IT is often advantageous for those engaged in continuous and arduous study to pause in their progress, and survey the ground they have left behind. Many difficulties of an earlier day, only half overcome at the time, are completely explained in the light of later knowledge; many results which appeared isolated and singular when first obtained, acquire a new and more general significance when connected by succeeding discovery. The old knowledge gains in symmetry and in exactness by retrospection, and the acquisition of that which is to come is thereby made easier and more sure.

I have chosen, therefore, to submit to your notice this evening, a paper which, in spite of the fact that it contains little which is not in some form or other familiar to you, will, I trust, be found neither uninteresting nor unprofitable. I propose to give some additional definiteness to your knowledge of the principle of the Conservation of Energy, by an enumeration, with but slight attempt at special explanation, of the various reservoirs of energy in the universe on which we are able to draw; the ultimate sources, so far as we can trace them, of the powers which we see in action around us, and which we are able to modify to a limited extent, and so to apply them to our purposes in the arts.

Let me recall to your minds, at the outset, a few definitions. *Energy* is the power of doing work, or of overcoming resistance of any kind. When an arrangement of bodies is able to raise a weight, it is said to possess energy, and the amount of its energy is measured by the result of multiplying the weight it can raise by the height to which it can raise it. A body in motion, if suddenly connected with a hanging weight, is able to raise the latter through a certain distance in virtue of its motion; which motion is gradually lost as the weight rises, and the body is at length brought to rest. In virtue of its motion, therefore, a moving body possesses energy, and this form of energy is called *kinetic*. A body acted on by a force, which it is prevented from yielding to, has the power of doing work by making its way towards the point to which the force tends as soon as the obstruction is removed; it is said to possess energy of position, or *potential energy*. I propose for the present to allude to the first form of energy as *power due to motion*, and to the second, as *power due to discontent*; if I may be allowed to speak of a body which tends to change its position under the action of force as dis-

contented with its place, and desirous of changing it by moving in the direction of the force.

In one or the other of these two forms the whole of the energy of the universe exists, and the principle of the Conservation of Energy asserts that whenever power due to motion vanishes, an exactly equal amount of power due to discontent is produced somewhere else; and *vice versa*, if power due to discontent is used up, an equivalent amount of power due to motion is produced. In other words, a body once in motion can only be stopped by its getting itself or some other body into a position in which they are not content to remain, as when a ball thrown up into the air gradually loses its velocity as it gets further and further from the position of rest on the ground; and on the other hand, if a body is released from a position of discontent, its continual tendency towards its position of rest causes its rate of motion to increase continually, so that it acquires an energy of motion which theory and experiment show exactly to balance the energy of discontent lost by its approach to the position it desires.

As therefore our only power of producing motion lies either in harnessing as it were the thing we want moved to a body already in motion, or to a body which, though not in motion, is in a state of discontent from which we can liberate it; it will not be uninteresting to review the various forms of motion and tendency to motion with which we are acquainted in nature, and to enquire, with respect to each of them, whether there is an available supply of bodies endued with energy of motion or of discontent on which we may draw as the motive powers for our machines. In this enquiry it will be convenient to treat separately those forces and motions which affect the whole visible mass of bodies, such as gravity, or velocity of actual flight through the air, and those which affect only the invisible molecules of a mass, and are therefore imperceptible directly, only betraying themselves in the phenomena of heat, electricity, and the like. The former are distinguished by the name of *Molar*, the latter by that of *Molecular*, forces and velocities.

In all cases of molar motion which occur around us, gravity plays some part. It does not however follow that the source of the energy manifested is in the earth. One of the chief modes of utilising power due to molar motion, is that of forcing the motion of the wind to turn a windmill. The amount of energy existing at any one time in air in motion is not extremely great, and is being perpetually wasted, but fresh air is continually being set in motion. The heat of the sun warms and rarefies the air in a particular place, in consequence of which action the warmed air rises, and cold air, rushing in along the earth's surface to take its place, forms what we call wind. Although one cause of wind is the earth's attraction, which

causes a heavy fluid to sink beneath a lighter, yet gravity is not the source of the energy here developed. To see this clearly, we have only to remember that though the air, like everything else at the earth's surface, is in a position of discontent, wishing to fall to the centre of the earth if possible, yet that after ages of blowing, the air is in precisely the same position as it was when the earth first solidified; it has not, as a mass, fallen any nearer to the centre of the earth; that is, it has lost none of its energy of discontent due to its position with regard to gravity. The whole of the energy which has been put into the winds, and taken out of them again, since the creation of the world, has come from the heat of the sun. So long therefore as the sun lasts, the winds will be available sources of mechanical power.

Very similar is the origin of the energy of moving water. The sun's heat raises water vapour into the air, and this, when it cools and condenses back into water, falls on the earth. So much of it as falls on high ground finds itself in a position of discontent, and its resulting energy changes itself on its course down to the sea into energy of motion. This, we are able to utilise in water-mills. Here again, the source of the available energy is the sun's heat, not the earth's attraction, for the water is no nearer the earth's centre now than it was ages ago. The power of moving water in streams, therefore, will last while there remain differences of level in the earth's surface and heat in the sun.

It has been proposed to fill tanks by the shore at high-water out of which when the tide falls the water may be allowed to run, and obliged to turn machinery in its course. A water-mill thus constructed differs entirely in the source of its energy from one built on a running stream. The tides are caused, as we know, by the attraction of the moon, but the sea is no nearer to the moon, now that the tides have been doing work on the earth for ages, cutting down cliffs, ploughing up the shores, and grinding down rocks, than it was when the waters were first gathered together into one place. I hope to be able to shew clearly that the source of the energy thus expended, and utilisable in such a mill as I mentioned last, is the energy which the earth possesses in virtue of its rotation round its own axis; and that if we raise a weight with such a tidal mill, we do so in a manner in its ultimate results very similar to winding the rope which carries the weight about the earth's axis, and making the earth's twenty-four hours rotation wind the weight up, slackening its speed slightly thereby. To examine this statement, remember that the tides are due to the fact that the moon is not always vertical at the same point of the earth's surface. Both the earth and the moon are in motion, but the motion of one relatively to the other will be very little altered, if we suppose the moon to be at rest, and the motion of rotation to be confined to the earth. The moon would then raise

a tide immediately under itself, and if the earth were able to rotate freely, and without friction, in its jacket of water, the hump of water would always remain under the moon, and as part after part of the earth was carried through the hump, each would experience high tide. The water would remain undisturbed, and the protuberance would always keep the same form. Now suppose the protuberance suddenly solidified and rigidly fastened to the earth. As the earth's rotation pulled it away from under the moon, it would form as it were a handle on which the moon's attraction would have a purchase so as to slacken the earth's rate of revolution. If the protuberance remained unchanged, when it began to approach the moon on the other side, the same action of the moon would quicken the earth's revolution, and so no permanent effect would be produced, the action in one way exactly balancing that in the other. Now everything which tends to hinder the free turning of the earth in its water-jacket, produces an effect similar in kind to the solidification above mentioned; for such hindering causes the water to adhere to the earth, and to be carried along with it somewhat as if solidly adhering to it. This is the effect of friction between the earth and the sea, and this effect would be also assisted by the storing up of high-tide water in tanks. But there is this difference between the cases of solidification and mere hindering of free fluid motion; in the first case the handle remains in its place, and the retardation is compensated as it returns to the moon; in the second, the water which is carried with the earth, whether by friction or by tanking, is uniformly distributed soon after high-water time, and thus the handle is destroyed before the compensation action can begin. The effect of the moon's action then on all water which accompanies the earth in its rotation, is to retard that rotation, and to retard it more as the amount of accompanying water is greater. The source therefore of all energy derived from the tides, as energy can only be got out of them by preventing the rising or retarding the falling of the water, is the energy of motion of the earth's rotation. So long as the earth is able to carry water away from under the moon, this source of energy will be available, that is to say so long as the earth's rotation is accomplished in less time than the moon's revolution round the earth, or so long as a lunar month is longer than a day. The lunar month is shortening, and the day is lengthening from this cause, but the change is almost imperceptible, except to the most delicate astronomical methods.

Weights when used as motive powers are merely reservoirs of the energy imparted to them in winding up. They are raised and placed in a position of greater discontent than before, but the source of the energy they exhibit is the muscular action of the person who raised them.

Passing to molecular forces, we may notice in passing that the purely mechanical force of elasticity is in the same condition as a weight when used as a motor; there does not exist a stock of elastic bodies in a state of constraint, and if we wish to use a spring to drive a piece of machinery, we must impart to it in the act of winding up all the energy which we mean it to expend.

It is to energy of discontent under the action of chemical forces that we have to look for our main reservoir of power. There is certainly only one pair of elementary substances which have a strong tendency to combine with each other, and yet exist in any quantity uncombined, viz.: the carbon in coal and the oxygen of the air. If it seems strange that we should be able to insist that these are the only two, we need only remember how wonderful it is that there should be any at all. In all the long course of changes which the earth has undergone, being, as we believe, originally formed out of matter of vapourous consistence at an intensely high temperature, the really astonishing thing would be that any substances with a tendency to combine, could have remained isolated. It would indeed be impossible: and we are obliged to allow that when the earth first cooled, the whole of the elements which were desirous of combining, at once entered into combination. The whole of the energy of chemical discontent which they originally possessed was given off as heat, and no store remained of uncombined substances such as carbon which might in virtue of their unsatisfied tendencies be used as fuel by being combined with oxygen at our pleasure.

The explanation of our confidence that no other substance besides coal exists in large quantity in a state of chemical discontent, lies in the extraordinary nature of the process by which carbon, notwithstanding its intense affinity for oxygen, has been actually separated from that substance and reduced to the state of discontent in which we find it in coal. The carbon of coal is not a store of combinable matter which has escaped combination ever since the creation, but it is the result of the sun's action through vegetable organisms on the carbonic acid which was formed by the first combination of the carbon with oxygen. Carbon is burnt, and this gas forms. The constituents of the gas have little further energy of discontent, but the power of the sunlight acting on plants exposed to the gas is able to separate the carbon and oxygen more or less; out of the former much of the tissues of the plant is built, and the latter is set free into the atmosphere. The energy, therefore, which we turn to account in burning coal, is not derived from chemical affinity, any more than the energy derived from a spring is due to elasticity; the coal after burning is not more thoroughly combined with oxygen than it had been before the sun set it free, again to go through the process of combination either, as under ordinary circumstances, in the slow decay of the plant in the

substance of which it is stored up, or when the plant has been by extraordinary circumstances prevented from decay, as in the coalfields, by the actual combustion of the fuel thus formed. As no such process as that which is carried on by vegetation is known to operate on a large scale with respect to any other element we are justified in asserting that no store of any other uncombined substance will ever be found to take the place of coal.

This process of reversing the chemical combination of carbon which goes on in plants is not a source of energy in the one case of plant-preservation in the shape of coal alone. Vegetables are the food of animals, and the burning up of their acquired stores of carbon is the source of the energy which animals manifest just as much as of that which appears in the steam engine. All animal energy is therefore derived from the sun's heat, precisely as the energy we use in coal is derived from that universal source.

The forces concerned in electrical phenomena, with which I shall close this somewhat scanty recital, afford us no available sources of energy, so far as we yet know. We have, of course, terrific manifestations of power in thunderstorms, but even if we had the means of turning the energy generated in them to practical use, the supply would be too small to be of lasting value. As to electricity artificially generated, we know of but two means of its production; the one by applying mechanical force to the turning of an electrical machine; the other by using the energy of discontent of an uncombined substance which has strong tendencies to enter into chemical combination with some other, as in the galvanic battery. In the first case, the energy of the electricity produced is only equal to the energy expended in turning the machine, and we gain nothing by adopting this course rather than directly applying the turning power to the object we have in view instead of making it turn the machine; in the second case we require a stock of uncombined material, which as we have seen we can only hope to find in coal. In order to work a battery, we require an uncombined metal of strong chemical affinities: but all metals of strong chemical affinities have already satisfied them, and there is no recuperative process, as in the case of carbon, continually setting them free for us. The consequence is that to provide the food for our batteries we have to expend at least an amount of energy equivalent to that which we hope to obtain from them. Zinc, for instance, with which most batteries are fed, exists in nature in a state in which its chemical affinity is nearly as completely exhausted as when it is removed from the battery. It has to be smelted out of the inert ore with an expenditure of carbon greater than that which would suffice to do the work obtained from the zinc through electricity. If our supply of coal fails, our power of producing food for galvanic batteries fails with it.

It appears therefore that our only stores of energy already laid up for us are the energy of motion of the earth's rotation, and the solar energy bottled up in coal. The former is not particularly available, as it is obvious that only a small portion of the power required in the arts can be obtained from tidal works. The supply of the latter is great, but limited; and when we remember the vast lengths of time required for the formation of coal, it is perfectly clear that no matter to what extent future coal fields may now be in process of formation, we are using coal faster than it is possible for it to be formed. The subject of the exhaustion of our coal supply has attracted some attention lately, and much wild assertion has been made in connection with it. The only certain fact we can make sure of is that we shall have in the long run to live on the energy that comes to us direct from the sun, without trusting to the mineral stores which have preserved for us the solar energy of the coal ages. How this will be done, we cannot even guess at present, it appears to be the great discovery of the future. The supply is sufficient, for the amount of solar energy we raise from the sun in a year is much greater than the amount of stored energy we are at present using. When the time comes for this discovery, it may well be that our present age, with all its mechanical appliances, will be looked on by the antiquarians of the period with the same mixture of interest and compassion, with which we regard the little we know of the life of prehistoric man. We study the development of the race in the successive periods, which we call the stone, the bronze, and the iron ages; they will add a fourth and higher, but still comparatively barbarous coal age, in which men were obliged to get all the motive power they could command from their deposits of coal.

We see yet another problem looming up in the distance far before us. When the coal is exhausted, as it may be in two or three hundred years, we may hope to be sufficiently advanced to use sunlight direct as a motor, but when the sun is exhausted, which as far as we can see must happen, there is no known fountain whence radiant energy may be dispensed. Utter stagnation and death for the visible universe, is written in the stars, so far as our science can read their characters.

ERRATUM :—

In page 96, for A Babington, *Esq.*, read the *Rev.* A. Babington.

MARLBOROUGH:
C. PERKINS, PRINTER, TIMES OFFICE,
1875.

TWENTY-SECOND HALF-YEARLY

REPORT

OF THE

MARLBOROUGH COLLEGE

Natural History Society,

(FOUNDED APRIL 9th, 1864.)

FOR THE

HALF-YEAR,

ENDING CHRISTMAS, 1875.

"Tum mihi Naturæ libeat perdiscere mores:
Quis Deus hanc mundi temperet arte domum."

MARLBOROUGH
PRINTED BY C. PERKINS, "TIMES" OFFICE,
1876.

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1·2 · CRATERELLUS CORNUCOPIOIDES, AND

3 · AGARICUS MUSCARIUS.

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PREFACE.

THE Committee regret that the publication of this volume of the Report has been somewhat delayed, mainly in consquence of the difficulty of getting the written papers from authors. The present volume can scarcely compare with the last, either in the matter of size or interest. An uniform condition of progress in anything is impossible, and we must not be surprised to find this Report of less interest than the exceptional Report of last Midsummer. The section work has not been very actively carried on, and we have still to complain of apathy on the part of the Members of the Society. It is altogether undesirable that such a constant process of "whipping in" should be necessary. The demands which the Society makes upon the time of its Members are few and far between, and it surely ought not to be necessary to constantly remind them that their section will meet, or that a General Meeting will take place, on a certain evening. The Committee has to express great regret that at the last General Meeting of the Society, only nine Members were present; in future, it must be understood that all Members are required to be present at the General Meetings. It is altogether unreasonable that men whose time is very much occupied, should be requested to prepare and read a lecture on a certain subject, and that the majority of Members should be absent.

The plate at the beginning of the report, was kindly drawn by F. E. HULME, Esq., F.L.S., F.S.A., whom the Committee take the opportunity of thanking for this and other attentions. A description of the subject is given elsewhere.

The Committee offer their sincere thanks to all benefactors of the Society, and especially to the numerous donors, a list of whom is given in the Report, to which have since been added a collection of Roman Coins, presented by MAJOR CREEKE,—and of Indian Coins, by C. E. G. CRAWFORD, Esq., O.M.; and a Fossil Echinus, and Fragment of Fossil Wood from the Desert of Sahara, by G. F. RODWELL, Esq.

The Weather Report for the years 1873 and 1874 has been published, and makes up a complete decade of observations. This will now be broken off, and a new series has been commenced, as the instruments have been removed to a more convenient position, and the observations are conducted on a slightly different plan.

Old Members of the Society will be glad to hear that it is in a state of great prosperity. The number of members is unusually large; and, though the work of the last half-year was not very active, it must be remembered that it was the Winter term, at which time of year Natural History is less easily prosecuted. There are certainly very good materials in the Society for hard work next year, and we hope that the Report of 1876 may transcend all others, and contain full notices, and proofs of sound sectional work, which are far more valuable than any number of papers made up out of old numbers and encyclopedias.

AGARICUS MUSCARIUS. *L.* AND CRATERELLUS CORNUCOPIOIDES. *FR.*

These two plants, so capitally figured by Mr. Hulme, are great ornaments to our woods in autumn, the former for its fine shape and brilliant color, and the latter for its curious cornucopia-like form. *Agaricus muscarius* is commonly scarlet on the top and studded with buff-white warts, but at times the top may be yellow, blood red, brownish, or possibly white, or sulphury-white. It is also found at times without warts, and the yellow variety (which is British) has recently been described on insufficient grounds, in Hungary, as a new species. Agaricus muscarius is a narcotic poison, which, on being eaten, produces a sort of delirious intoxication and it is said even to cause death, of which several instances are recorded. Possibly however, some of the accounts of the poisonous properties of this species may be exaggerated, though the whole sub-genus *(Amanita)* to which this plant belongs, is, to say the least of it, a very suspicious one, and the edible allies when eaten raw are nauseous to the taste, and have a tendency to constrict the throat. A near ally is *Agaricus rubescens*, always more or less brown on the top, and with tender flesh and gills which change to sienna red on being touched or bruised. A homœopathic preparation for chilblains is made from this fungus which may be occasionally seen in Chemists' shops in London.

Craterellus cornucopioides belongs to a different order of the Hymenomycetes from the last, and is principally distinguished by its even (rarely veined) hymenium, (or fruit-bearing surface represented by gills in Agaricus muscarius). This character is however by no means constant, and it must be confessed that Craterellus runs gradually into the Genus Cantharellus (which belongs to the Agaricini), where the hymenium is decidedly veined. Various species of both Craterellus and Cantharellus grace our woods at the fall of the year, but Craterellus Cornucopioides is at once the commonest and largest. In shape it is like a "Horn of Plenty," or an irregular black gray trumpet, and from its intense dull color it forms a strong contrast with the many ivory-white and brightly colored agarics, so common in woody places. Other and less common species of Craterellus are white or yellow in colour. As far as we know its qualities for the table are unknown.

W.G.S.

LIST OF MEMBERS.

President:

Rev. T. A. Preston.

Treasurer:

J. B. Kitt.

Secretary:

R. Armitage.

Librarian:

D. H. Davies.

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W. S. Robinson
C. E. Blackett-Ord.

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W. T. Trevenen
T. H. Clark
W. Pemberton
F. M. Preston
H. P. Davis
G. Hastings

RULES.

1.—That this Society be called the Marlborough College Natural History Society.

Constitution.

2.—That the Society consist of Members, Honorary Members, and Associates.

Officers.

3.—That the Officers of the Society consist of a President, Secretary, Librarian, and Curator, to be elected from and by Members of the Society.

Election of Officers.

4.—That those Members of the Committee, who are not ex-officio Members, be elected terminally and that the retiring Members be eligible for re-election.

5.—That the same rule apply to the Librarian.

6.—That each candidate for election give in his name to the President, any time before the day of election.

7.—That all canvassing for votes by a Candidate, or by his friends with his knowledge, shall at once disqualify him for any election that term.

8.—That any Member canvassing for votes for a Candidate, or for a new rule, forfeit the right to vote on any occasion during that term.

9.—That the election of officers of the Society take place near the end of the term, but that they do not come into office till the beginning of the next term.

10.—That on the occurrence of any election, each Member of the Committee have double the number of votes of any other Member of the Society.

11.—That in the event of a vacancy occurring in the Committee or any other office to which Members are elected at the beginning of each term, the vacancy be filled up by the Committee.

12.—That eight Honorary Members have the power of debarring a candidate for standing for any office.

Management.

13.—That the affairs of the Society be conducted by a Committee, consisting of the President, Secretary, and three other Members of the Society, to be elected from and by Members of the Society; three of whom shall form a Quorum.

President.

14.—That in case of an equality of votes, the President shall have a double or casting vote.

15.—That in the absence of the President, the Committee be empowered to request any Member of the Society to take the chair.

Secretary.

16.—That the duties of the Secretary be to keep a list of all the Members of the Society, and of all former Members and Benefactors who may wish to receive the Reports of the Society; to summon meetings (when necessary) of the Society; to keep a detailed report of the proceedings, as well as lists of Members and Visitors present at each meeting, and generally to act under the direction of the Committee in all matters connected with the welfare of the Society.

17.—That in the absence of the Secretary from any meeting of the Society, minutes of the proceedings be taken by a Member of the Committee, appointed by the President.

Librarian.

18.—That the duties of the Librarian be to keep a catalogue of the Library, with the name of the Donors, and to see that the Library Regulations are carried into effect.

Curator.

19.—That the Curator be responsible for the order of the Museum, and when necessary assist the Secretary in the distribution of the Reports of the Society.

Library.

20.—That any Member of the Society be at liberty to consult any of the books belonging to the Society, but that only certain volumes, to be decided on by the Committee, be allowed to be taken from the room.

21.—That if any Member wishes to take a volume from the Museum, he shall give his name, and the name of the book, to the Librarian, who shall enter them in the book kept for the purpose.

22.—That every volume so taken out be returned by the end of the term, but that no book be kept more than one month.

23.—That if any volume be damaged, such damage shall be reported by the Librarian to the Committee, who shall decide upon any further proceeding in the matter.

Museum.

24.—That any Member of the School, who is not a Member of the Society, be allowed access to the Museum at such times as it is open to Members of the Society generally, provided he first obtain leave from the President, which

leave shall be renewed every term, but may be taken away at any time, if the privileges be abused in any manner.

25.—That in all cases the Museum be used for the study of Natural History alone, and not as an ordinary Reading Room, except on Sundays.

Botanical Garden.

26.—That the Garden be under complete control of the President, or of some person appointed by the President.

27.—That the Garden be open to Members of the Society, at all times, and that each Member be allowed to introduce one visitor.

28.—That any Member on application to the President can have the charge of a bed.

29.—That no plants be put in without special leave from the President.

30.—That Members may keep any plants of their own in such places as the President shall appoint, as long as the ground is not required.

31.—That the Society's flowers may not be picked.

32.—That Members may gather from their own plants, but may not depute others to do so.

Members.

33.—That the election of new Members rest entirely with the Committee.

34.—That every Member pay a terminal subscription of 2s, to be paid at the first meeting of the Society in that term.

35.—That if a Member be elected after the commencement of the term, the amount of his subscription for that term shall be settled by the committee.

36.—That Members have the right to be present, to state their opinions, and to vote at all general meetings of the Society; to introduce two visitors at all general meetings of the Society; to have personal access to the Museum, and to introduce a visitor at such times, as shall seem fit to the Committee.

37.—That Members be considered as Probationary Members for the first term after their election.

Honorary Members.

38.—That Honorary Members have all the privileges of Members, except the power of introducing a Member of the School to the meetings of the Society.

39.—That Honorary Members pay 5s. a half-year, for which they shall be entitled to a copy of the Report.

40.—That Honorary Members may compound for all future subscriptions by the payment of a sum of two guineas.

Associates.

41.—That Associates be confined to members of the VIth and Upper Vth Forms; that they pay 1s. a term, and be entitled to the use of the Museum,

and to attend the meetings of the Society whenever they think fit, but shall not be entitled to vote on any question, to introduce a visitor, or to take books out of the Museum.

Visitors.

42.—That on such occasions when the number of those who wish to be present as visitors at the general meetings of the Society is greater than the number of Members who attend, the President and Committee shall be empowered to admit three or more each, as shall seem fit.

Suspension of Members.

43.—That any Member be liable to be excluded from the Society by the Committee, if, in their opinion, he shall have failed to show sufficient energy in the working of the Society.

Sections.

44.—That sections be formed for the more accurate study of the different branches of Natual History, and that the heads of these sections be chosen by the committee half-yearly from Members of the Society.

45.—That these sections shall hold meetings as often as shall seem fit to the Heads of the several sections, at which any Members of the school, with the sanction of the Head of that section, may attend.

Meetings.

46.—That ordinary meetings of the Society be held once a fortnight, but that the Secretary be empowered to call extraordinary meetings when necessary.

New Rules.

47.—That any Member of the Society have power to propose any new rule or any alteration in an old one, provided the motion be seconded by another Member

MICHAELMAS TERM, 1875.

GENERAL MEETING, SEPTEMBER 22ND, 1875.

The following arrangements, subject to alterations, were made:—

Botanical Section.—Meetings on Sept. 28th, Oct. 12th, 26th, Nov. 9th, 23rd, Dec. 7th.

Physical Section.—Meetings on Oct. 1st, Nov. 5th, Dec. 3rd.

Ornithological Section.—Meetings on Oct. 6th, 20th, Nov. 3rd, 17th, Dec. 1st.

General Meetings.—Oct. 5th, Nov. 16th.

W. S. Robinson and C. E. Blackett-Ord were elected on the Committee, and J. B. Kite was elected Treasurer. R. Armitage was appointed Secretary.

GENERAL MEETING, OCTOBER 8TH, 1875.

This meeting was deferred in the hopes of securing the aid of Mr. W. G. Smith, the eminent Fungologist, but his engagements were too numerous to allow of his being present. The Rev. A. G. Bleeck kindly undertook to superintend the arrangements. The season was not so propitious as had been hoped for the collection of Fungi, but by the exertions of Mrs. and the Misses Gwillim, the Misses Preston, and Mrs. and Mr. Featherstone, a very large number of species was collected, which were very prettily arranged in the Bradleian. Most of the species exhibited last year were also exhibited on the present occasion, though one or two notable exceptions were lamented. A few additional species were secured, and thus the exhibition was nearly as extensive as that of last year.

The REV. A. G. BLEECK gave the following lecture in connection with the exhibition, illustrated by Mr. Worthington Smith's two plates of Poisonous and Esculent Fungi:—

"Your attention is invited this evening to a branch of Natural History that has only of very late years become an object of any general study, and that even now cannot be said to number in its pursuit a very large array of expositors or experts, though from the interest which any little acquaintance therewith at once excites in those who approach it, the number of students in this branch of knowledge is decidedly on the increase.

In the limits of such an address as I can only venture to make to you this evening, I cannot attempt to enter into anything like a scientific exposition—indeed it would serve but little purpose if I did: it would merely result in being a dry technical statement and you would practically know as much or as little of it as you did before. For believe me, there is no royal road to the knowledge of Fungi: it is only by the most patient and painstaking personal research that they can be known at all. I may perhaps, however, be permitted to make mention of a few technical terms in connection with Fungi in describing and distinguishing them, for the benefit of those who may not have approached as yet even the mere rudiments of the study.

Mushrooms, though plants, have no root; but a number of feeble, entangled, cottony-looking threads are found at the base of each fungus, and are called the *mycelium* or *spawn*. These develope a little protuberance, which enlarges and ruptures, and the young mushroom may be seen within a surrounding membrane, called the *volva* or *wrapper*. From this mycelium, then, there proceeds the *stipe* or *stem* of the mushroom surrounded by the remains of the volva or wrapper. The stem is surmounted by a *pileus* or *cap*, bearing *lamellæ* or *gills* on its under surface, which have been exposed by the disappearance of the *indusium* or *veil*, leaving traces thereof (often very visible) in the form of a ring surrounding the stem. The gills are covered with the fructifying surface, termed the *hymenium*, which bears the spores or reproductive bodies.

But all fungi are not gilled; in fact, the gill-bearers form only one portion of the class, but the above is given for the sake of the terms which may be made use of in the subsequent part of this lecture.

I have been often asked "are there no general features by which their several individual qualities can be known? no test, for instance, by which their wholesomeness or noxiousness can be ascertained with some degree of certainty or safety? no indications, such as colour, or smell, or conformation to give one some intimation of the temper of the creature?" My answer is invariably, as I have learned on my part from all fungological writers, there is no general rule that can be laid down of course, but you can only really decide this by an intimate personal knowledge of each individual Fungus. In fact the only safe guide lies in marking one by one the specific distinctions between Fungi, just as you would with plants in Botany, and in increasing the number of one's own acquaintances among the Esculent gradually, by dint of knowledge and experience, even "as a child learns to distinguish a sweet nut from an astringent acorn; or with wider experience will eat the pleasantly acid leaf of the wood sorrel, and reject the similar but insipid leaf of the white clover."

This admission I know is enough to deter many from making any attempt to gain a better knowledge of them, especially when they hear in the

next place that there are of all sorts in this country alone about some 3,000 species. However, a very large number are very "ken-speckle" and easily recognised after a little acquaintance, and if I limit my attempt at introducing to your notice this evening the few specimens which are figured on these two sheets of Mr. Worthington Smith's Edible and Poisonous Fungi, I hope I shall have done sufficient to make the collection gathered here this evening attractive and familiar enough to you to serve an interesting and instructive purpose, and to induce you to inquire further for yourselves in this singular, and may I add, fascinating study. At least believe me when I say that such, notwithstanding its formidable appearance in print, it turns out to be on actual acquaintance. I think when any one of you has once had experience of one or two days' foray among the Fungi in our delightful and abounding forest, you will acknowledge that there really is an unaccountable fascination in the actual pursuit thereof. To turn then to these sheets, here are some 60 specimens depicted, and I believe we may have on the tables some thirty individuals of them actually exhibited. Let me point out a few of them detailing their supposed qualities either good or bad. And *imprimis* for the edible ones, and here first among them in spite of all that Mycophagists may say—here is the Mushroom proper *Agaricus campestris* too well known, either in its cultivated or uncultivated state to need much comment from me. I can only say that I wonder anyone possessing a horse in his stable does not make it his study, and a successful one, to grow them on his own premises. And here let me add also this word of parenthetical remark to anyone who might object that even the common Mushroom is sometimes found unwholesome and noxious; very true, what the proverb says was never more correct of any other article of food than it is of the whole Mushroom tribe—"What is one man's meat is another man's poison." Of this however you must be the best judge after personal experience yourself, if after eating mushrooms or fungi of any kind you suffer colicky pains or other signs of indigestion, take Mr. Punch's advice to people about to marry, and when offered to partake of a dish of these delicious comestibles—"don't"—as you value your own internal comfort. But don't measure your neighbour's interior economy by the weak standard of your own; he can eat and enjoy without fear of harm and with much gusto,—and let him.—Here again is the Meadow Mushroom, *Agaricus arvensis* or *exquisitus* as some name it, what is popularly called the horse Mushroom; it may be known by its turning a little yellow when handled or bruised, and being of a coarser, stouter build than its more delicate companion last mentioned, but it is sometimes liked as well, and even better, by some eaters of it. Yet here again I would say, if your digestion is weak be content to leave it to the strong stomached. At any rate it will serve to make you capital ketchup, so gather it when you find it. A good many are eaten from the London Market as the ordinary Mushroom,

by those who don't know them apart. It is called the horse mushroom, not because horses will eat it, though sheep and cows will do so sometimes, but from the enormous size it frequently attains, some having been known to reach the weight of 14 lbs. or upwards.

Here is *Agaricus rubescens* which belongs to a very suspicious group of fungi. (The *Amanita*, in which the cap or pileus as you notice is commonly studded or sprinkled with little warts, which are in fact only the remains of the investing volva or wrapper, out of which the plant starts into birth; to this group this ferociously poisonous but splendid *fly agaric* belongs.) Notwithstanding its bad company however, this Rubescens has a good reputation, especially for making ketchup. Its name is derived from its tendency to become red when bruised. There is a cognate variety said to be eatable, called *Asper* much rougher on the top, to be seen on the tables, and another white variety *vaginatus*, not here I believe this evening, and also this rare variety, *Strobiliformis* or Fir-coned amanita, which we have only found once. Ah! And now we come to an esteemed and delicate esculent. A scaly-capped snake-marked fungus *Agaricus procerus*, (or *Lepiota*, from its scaliness) with tall slender stem, hence its Latin name; but sometimes called the Parasol Mushroom from its shape, and the loose ring that will slip up and down it. It is very eatable, I have eaten many dozen, and very delicate and sweet I always find them. But here again take care to have them quite young, and remember the eating of fungi when at all gone off or become old and battered, has sometimes done them discredit, because they are in that condition unfit for food, and have naturally not agreed in that state with the eater: they are very perishable, and should not be used when the least decaying. This fungus is getting to be a good deal known among the poor, and to be eaten and relished by them; it makes a capital poor man's pudding mixed with bacon, and boiled or baked. There is another similar fungus, but coarser and not quite so good—*Rachodes*.

Here is *Agaricus nebularis*, the Clouded Agaric, with its smoky-coloured cap and profuse white spores, with gill-segments decurrent, *i.e.*, running down the stem, found generally on heaps of dead leaves, with a peculiar penetrating odour, and mild, but Mushroomy taste, said to be one of the most digestible of Agarics.

Here is *Agaricus gambosus*, St. George's Mushroom, found in the Spring, about St. George's day, April 23rd, when esculent fungi are rare, and its congener, that is found among our latest Autumn growths, *Agaricus personatus*, or Blewits, with its violet-tinted stem, much esteemed and eaten by our people in the Northern counties. We are too early for it this year, though we had plenty of it last year, some grown in your own play ground. On the tables are also one or two very handsome species akin to this, thought to be, but

not certainly acknowledged as esculent, of a beautiful violet tinge; by daylight it would charm you much, but in this light you will not discern its delicate tint, it is named *Lepista Nuda*, from the clear naked look of the plant. There are also two fungi of which only one is figured here, though both are on the tables. *Agaricus Prunulus* or *Plum Clitopilus*, and his sister Mushroom *Orcella*, the Little Ear; the former with a smooth, soft skin, and mealy odour, the latter with a delicate kid-glove feel; both are fragrant to the smell, and both enjoy a good reputation. Here is a clear ivory-white fungus of a similar character, *Agaricus dealbatus*, which grows in great quantities in dry fir plantations, said to be good eating. A more robust and larger species which we had here last year, but not now, *Geotrupus*, is said to be esculent

Another curious mushroom, of which I believe we have a small specimen to-night, with the stem lateral, or projecting from the side, generally grows out of trees, and is called *Agaricus Ostreatus* or Oyster Mushroom. And then before turning from the Agaricini or truly gilled Mushrooms, we notice *Marasmius Oreades* the well-known Champignon, so admired and used by our French neighbours in their cookery, which you may find in your own playground in their "fairy rings." Observe its broad wide-apart gills, and its colour of dog skin gloves. I say before turning from these, let us cast a glance at two families which come under the family name of Agaric, but have separate genera of their own; the *Lactarii* or milky Mushrooms, and the *Russulæ* or fleshy rosy coloured ones.

The *Lactarii*, terrible fellows, have a fearful array of spiteful "*cows*" in their dairy, for they are all in the "*milky*" way, and have many savage members on the poisonous sheet. *Piperatus, acris, rufus, torminosus, theiogalus, pyrogalus*, whose very names carry their own condemnation, but they have some gracious some beneficent beings within their ranks. *Deliciosus* or Orange Milk, with its bright orange gills turning *green* directly it is bruised, a "horrible sign you will say."! No not at all. You may eat it without fear, and will I trust, for universal commendation is said to fall upon this species, and the *Mycophagists* say you ought to do so. I hope you will fancy you are eating lamb's kidneys. Hum! I have eaten a good many of them, and think that that is a matter of opinion. Then here is *Lactarius volemum*, the Orange-brown *Lactarius*, another kidney-tasting gentleman with white mild milk somewhat of a peary flavour with no after sting like the other pear-fellow, *pyrogalus*, that blisters your tongue if you think to treat him like that favourite fruit.

The *Russulæ* too—somewhat like the last species, but without milk; there are many species here said to be eatable, and liked by many who have tried them—one friend of mine affirming that this species, *Russula heterophylla*, is the best of all fungi, so crisp, and sweet, and nutty. He certainly looks nice, and so does his *congener* that is not quite so green, but more variable in colour

(from whence indeed this section of fungi derives its name *heterophylla*,) having a little tinge of red with the green, named *vesca* to tell you he is eatable. You will find specimens on the tables. *Alutacea* again, the colour of bright tanned leather, by no means to be despised says Mr. Cooke, though Dr. Badham has placed it among those to be avoided, and there my friends, if you take my advice, you will also class it.

These are all I think of the *Agaricini* except this one, the *Comatus* or Maned mushroom, of the family of *Coprini* because generally found on dung-heaps or other decaying substances; they are very deliquescent and leave a black inky stain on the fingers, and are good for very little but making ketchup. I saw one of this family growing on the ceiling of a poor person's cottage the other day.

After the gilled mushrooms I may point out one that seems to have gills, and yet has nothing but a sort of skin drawn as it were over ribs or gills, though classed and described among the *Agaricini*; the *Cantharellus* or celebrated *Chanterelle*, supposed to have a most charming and enticing appearance and odour. In colour it is of a bright golden yellow, and its smell has been compared to that of ripe apricots. It is almost universally eaten in all countries where it is found except in England, where it is only used on state occasions, and on the tables of pertinacious *Mycophagists*. Trattinick says, "not only this same fungus never did anyone any harm, but might even restore the dead to life again." So say the books—but I suppose one may have one's own opinion, and mine is that both in odour and taste it is uncommonly like scented soap, and I would as soon eat one as the other, however there are lots of it here, as well as in the forest, and you may try for yourselves.

Next we come to the *Polyporei* or many-pored mushrooms; the *Boleti*, or tubed mushrooms, with tubes instead of gills first claim your notice, of which this robust gentleman is the most esteemed member, in his very name *Boletus edulis* declaring his own respectable character. He is very rich eating when cooked with butter, believed to be the *suillus* eaten and esteemed by the ancient Romans, and strung up by the modern Romans to dry, to keep and to be made into soup. Well, I believe he is innocent, though that is more than I am prepared to confess about his first cousin *Boletus scaber* which Dr. Badham says has an agreeable odour, or Mr. W. Smith, who is very catholic in his taste for *Boletuses*, eats without fear, though he does not figure it in his sheet here. It is on the table; notice its rough dark speckled stem so different from the delicate *reticulations* you will see on the stem of *Edulis*. But these gentry have some terribly disreputable brethren, their very names declaring their characas *Satanas* and *luridus*, which turn green and blue when bruised or cut; and *felleus* the bitter as gall—and *piperatus* the hot as cayenne pepper.

Two or three more only claim your notice. Here is another of the *Polyporei*, *Fistulina hepatica*, the Beefsteak or Liver fungus, which makes its

own rich gravy like a broiled steak while you cook it, represented on the table by a nice little specimen found on a noted oak in the forest. We do not find very large ones here, but sometimes they reach an enormous size, and weigh as much as 30lbs. In Austria they are sliced and eaten with salad like beet root, which they are then said to resemble.

Hydnum repandum, with its curious spines instead of gills, likened to stewed oysters say some—kidneys say others—anything you please, for the matter of that say I—you will find this year in some numbers. *Helvella crispa* and *lacunosa* with their curious ear-like heads, they make a very flavoury addition to a stew, but are rather tough to eat themselves. Then I must not omit what I think one of the best of fungi, *Morchella esculenta*, the well-known Morel—of which this chalk bearing county is a great producer; they are very common in Wiltshire, if you know where to look for them. I found them once in a park about 20 miles from here by the basket full, and some come up in my garden every year, and very good I always find them when stewed for a few hours in butter or gravy. It is one of the fungi we ought to be able to cultivate here in the spring.

Cortinarius too, I may mention, though I should not care to eat it—he has some interesting representatives however on the table, though not I believe this one, *violaceus*; last year we were able to put a specimen or two of him there. The Truffle too *Tuber æstivum* which is found largely in this forest and in many other parts of Wiltshire by those who know how and where to look for it, which is more than I can say of myself, for I have never been fortunate enough to find one—nor any of our party, or you might have seen one here to-day. *Clavaria vermiculata* like a bunch of white candles, and *rugosa* like a bunch of clubs, and *coralloides*, like a bunch of coral, are all supposed to be eatable; but of coloured *clavarias*, Mr. W. Smith says you had better leave them where you find them growing, as their gastronomic qualities are doubtful, and I recommend you to take his advice regarding them, unless indeed you gather them to bring them here and make such a tasteful bouquet of them, as our lady friends have done to-night, with their varied colours, yellow and orange, and amethystine and white and what not. And last though not least, there is the familiar Puff-ball, *Lycoperdon*, which when cut into slices and egged over and fried, is said to be as good as any well whipped fritter. *Experto crede*—as long as my cook will make me eatable fritters and omelets from the produce of my poultry pen, I shall be quite content with them. When my hens don't lay eggs, why I will try fritters of *Lycoperdon giganteum*,—perhaps!

Last year we had here a glorious representative of this species to reign as monarch of all he or you surveyed. This year "*heu mihi hiatus valde deflendus.*"

I have left myself but little space to touch upon our sinister sheet. Sinister indeed; take my advice respecting them. Know them to be "better strangers" to you. 'Tis as well that some of them should "not come between the

wind and your nobility," this individual to wit of evil name and odour, *Phallus Impudicus*. Pah! Mr. Preston you have got some not very far distant. I can aver, I tracked one yesterday for a score of yards, and winded him by the scent like a fox hound till I ran into him. It is said by some writers that the stem, curious and delicate like carved ivory, is edible, and by others that its Gelatinous volva is valued by New Zealanders, to whom it is known as *thunder-dirt*; whilst another kind of *Phallus* is applied to like purpose by the Chinese; and these examples might lead us to recommend a similar use for this specimen, or induce us to prove the assertion of a Scotch *mycophagist* that the porous stem is very good eating; at any rate Mr. Preston has three or four in several stages of development, and which he is reserving as a *bonne bouche* for any one of you who would like to try them after the lecture.

What shall I say more, they are very brilliant and many of them captivating to the eye; but *O formose puer nimium ne crede colori*. Like the herring when he snaps at the red rag or the clodhopping recruit at the scarlet cloak, "Ye'll rue the day ye first gave trust to them." They are like dead-sea apples—fair to the eye, but worse than ashes to the taste. Fortunately they are—very many of them—easily recognised, at least those on this sheet, by their colour, acrid milk, or such like suspicious features, and once known, can be avoided. There are several specimens of them on the tables, and others not figured in either list, of which we know little or nothing, in some cases not even the names. One of the most beautiful fungi in the field is at the same time the most deleterious, the *Amanita muscarius* or Fly Amanita, which is sometimes made into fly poison. [This species is figured in the coloured plate at the commencement of the Report.—*Eds.*]

There are many other points of interest among fungi which might be touched upon, but they would stretch this paper beyond the limits of your patience, if even that point be not already gained. I might, for instance, recount and bid you note the varied and vivid tints of many of the more conspicuous sorts: the flower-like character that many present, as the *craterellus*, so like a handsome dark Petunia (you will see it in full force and beauty to-night); *Tricholoma rutilans* with its cunningly mingled lilac and yellow—*Amanita muscarius* with its glowing scarlet—*Lepista nuda* with its rich violet. Or I might touch upon the terribly destructive character of others; I might speak of the *Peronospora infestans*, the well-known potato rot, and the curious discoveries that are even now being made concerning it; of *Penicillium crustaceum*, the vinegar plant, which turns wine or molasses into vinegar; the *Oidium*, which ruins our grapes; the *Sphærotheca*, that destroys our hops; the *Grysophe* that mildews our garden pears; the *Puccinium* and *Uredo* that rust our wheat; the *Mucus mucedo*, moulding our bread and other food, (all fungi every one of them); besides a countless array of them, all enemies to every perishable substance, for nearly everything perishable has

its own fungus that fattens on its decay. All this, and many other interesting features appertaining to their study would ask for notice, but the time is all too short.

I can only recommend to your inspection and attention the carefully arranged tables before you: asking you to compare the specimens there exhibited, where they correspond with the figures on these sheets, and recommending you to make any enquiry concerning the varieties not there named, of the friends who have brought together this collection, whose diligence I cannot too strongly commend and return thanks for on your behalf; and I can do so the more readily and disinterestedly as I believe you owe the very charming and distinct arrangement of the specimens collected, which is presented to you this evening, to the zeal and industry and taste of the ladies of our party alone. To them the chief credit and thanks are due of this very pretty and interesting exhibition, for they have worked as hard all to-day in arranging, as they did yesterday in collecting.

In conclusion, I will only quote for your incitement the earnest words of recommendation written by our most reliable guide in this study, Mr. Cooke, in his last work on this subject, which he urges upon all those who have followed to any degree this branch of botany as their speciality. He says, "Hitherto it has been very much neglected, and a wide field is open for investigation and research. The life history of the majority of species has still to be read, and the prospects of new discoveries for the industrious and persevering student are very great. All who have as yet devoted themselves with assiduity have been in this manner rewarded. The objects are easily obtainable, and there is a constantly increasing infatuation in the study. Where so much is unknown, not a few difficulties have to be encountered, and here the race is not to the swift so much as to the untiring. May our efforts to supply this introduction to the study receive their most welcome reward in an accession to the number of the students and investigators of the nature, uses, and influences of fungi." May I, my young friends, re-echo the expression of such a hope and paraphrase it as regards yourselves by saying "May these field days and exhibitions, thus started and repeated, induce many of you to make this a scientific and practical branch of your botanical studies, and as you have helped the President to draw up and publish a Flora of Marlborough, that will be a badge of honour to your School Natural History Society, so may you add a further and unexampled feather to your Society's cap by enabling your president to collect and publish a similar index of fungological treasures that shall be a credit to his and your efforts, and may greatly assist the cause of the Science itself."

GENERAL MEETING, NOVEMBER 23RD, 1875.

T. O. HARDING, Esq., read a paper on "Galileo."

The lecturer showed what very great difficulties Galileo, in common with all discoverers of former times, had to encounter, and his discoveries were certainly of immense benefit to scientific men of succeeding generations. Galileo was the son of an impoverished nobleman, and was much devoted in his younger days to music and painting, as well as to the study of mathematics. The latter was forbidden by his father, as he was intended for the medical profession, but nevertheless he worked up the first six books of Euclid in secret; and, as he evinced such a decided taste for mathematics, he was allowed to relinquish his medical studies. He was a "horrid bore" to his masters, as he asked for proofs of every opinion they gave. He invented the thermometer and the telescope, and the latter instrument enabled him to prove the Copernican system of astronomy to be correct; he was a wonderful experimentalist, and all his theories were based on experiment. He was first a mathematical professor at Pisa, when he declared that a large stone and a small stone of the same material would fall to the earth at the same time if dropped from the same height. Everybody else said a stone twice the size would fall twice as quickly, but Galileo was proved to be right by experiment from the leaning tower of Pisa. This so disgusted the other Professors that he was obliged to leave the town. Galileo afterwards became Mathematical Professor at Padua; there he gave out that the world moved round the sun. This the monks obliged him to recant in the most solemn manner, but on rising from his knees he whispered to a friend "For all that it moves." After this he was kept under such close surveillance that he could make no further scientific discoveries ere he died. He was a brilliant example of immense perseverance, in spite of all discouragements, and of that prejudice against new theories, which survives even to the present day.

The attendance at this meeting was very small. Only about ten Members of the School, and fifteen Visitors were present.

PHYSICAL SECTION.

There were three meetings during the Term, at the first of which Mr. DRURY's paper on Wave Motion was again read (*vide* p. 62 of last Report). At the second meeting a paper was read by A. J. BURNESS, on the Sun; and at the third meeting two papers were read, one by H. W. THATCHER, on Two Applications of Electricity, and the other by A. E. GARROD on Soap-Bubble Spectra.

DEC. 2ND, 1875.

TWO APPLICATIONS OF ELECTRICITY.

I MAY commence my paper, by describing a visit to a signal tower on the East coast. This tower is in connection with the electric clock at the Greenwich Observatory, and is used for correcting ships Chronometers. It consists of a four-storied square tower, on the top of which is a large ball of galvanized iron. At 5 min. to 1 every day, the ball is raised by machinery within, half-mast high, and at 3 min. to 1, to the top of the cross. Punctually to the second at 1 o'clock, Greenwich time, the ball drops, and after a few bounds settles itself till the next day.

On the top story of this tower, there is all the apparatus used, and through the middle ascends the shaft enclosed in a case. The shaft has cogs on one side in connection with a wheel. At 5 min. and 3 min, the shaft, then, is wound up by this wheel; when the ball is at the top, two hooks projecting from the case, impelled by springs, catch in corresponding projections on the shaft. Behind these hooks, there are two powerful electro-magnets, which only exercise their attraction when a current of electricity is passed through them. Outside the shaft is a handle connected with the hooks, which is pushed up just before the current comes, and is in its turn attracted back to the position of rest by another electro-magnet. A wire passes from the electric-clock at Greenwich to the tower, through a battery round a Ruhmkorff's coil, and sets in motion a telegraph needle, thence round the three magnets to the earth, where the current disperses.

It is impossible to forget to send the current, for when the clock at Greenwich strikes 1, by its very action the current is started. The three electro-magnets now begin to act, the hooks are sharply pulled aside, and the ball drops.

To certify to the people at the Observatory that the ball is fallen, the shaft on reaching the bottom of its case, completes another circuit, and a return signal (merely a movement of a needle) is sent to Greenwich.

Now were the ball, (which weighs half a ton) to drop suddenly from top to bottom, the tower would soon be shaken down, and much care is taken to prevent this. The shaft is terminated by a plunger, which exactly fills the

case. The plunger is fitted with a stop-cock, while at the bottom of the case is another stop-cock. The shaft is about 12 feet long, hence the ball ascends 12 feet.

The conditions under which the ball is at rest are,—the stop-cock in the plunger is open, as is also that at the bottom of the case,—the hooks and handle are pressed slightly by springs, and the whole machinery is motionless. Fig 1.

At 5 min. to 1, by his chronometer, the attendant winds the ball half-mast high; at 3 min. up to the top of the cross. At a given signal, by pushing up the handle, he disengages the shaft from all connection with any machinery, and it rests solely on the hooks. He turns off the stop-cock at the bottom of the case and waits. Precisely at 1 comes the shock. With a tremendous crash, the hooks dart aside, and the ball falls with a swoop of 9 feet; *now* the elasticity of the fearfully compressed air manifests itself, and the ball rebounds again at least four feet; after a few bounds, it settles quietly down on an india-rubber cushion, outside, and the return signal is sent, and all this happens in far less time than it takes to relate it.

Sometimes the current is stopped, by neglectful clerks forgetting to keep up the connection of the wires; they are instantly dismissed, and of course it is easy to find the offender. At other times an electric storm disturbs the wires, and the current is obliged to be turned to the earth. In such cases arrangements are made to shew the shipping that an accident has taken place. Snow is said to retard the current, as also continuance of rain. There is much interesting apparatus at a place like this, and I should advise anyone, who has the chance, to visit one of these ball towers.

The electric light was discovered early in this century by Sir H. Davy, a native of Penzance, where there is a statue put up to his memory. I cannot pass over this great man, without saying a few words about him. He was born in 1778. His name, as you know, is famous for his important discovery of the safety-lamp, and though this invention was everywhere acknowledged for its value, he only received a baronetcy after three years. He died at Geneva at the early age of 51, universally lamented; and as he rendered so much service in that short time, we may conjecture that he would almost have eclipsed even Newton.

He, then, found that when two wires, emanating from a battery and connected with Carbon points, are brought within a short distance of each other, the intervening air is occupied by an intensely dazzling white light.

This enormous evolution of light is accompanied by heat as intense. The heat thus evolved is sufficient to melt most of the metals, but the carbon itself remains absolutely infusible. A battery of 600 cells was once used by Despretz, in the endeavour to melt carbon in a vacuum, the carbon itself was found infused, but the exhausted receiver in which it was placed was

found covered with apparently volatilised particles of carbon, in minute crystals.

The arch of light and heat between the Carbon points is called "The Voltaic Arc." This brilliant experiment was first performed by Davy with a battery of 300 cells.

The following is a simple arrangement for producing it. The Carbon points (Fig 2) P.N. are fixed into hollow brass rods, connected with the battery by the wires bound at S,S. The rods slide in the heads of A.A. to admit of their being adjusted to the proper distance. The wires being connected with the battery, the points are drawn together, and then withdrawn a line or two, for the light is not produced unless they first touch each other, when the most dazzling light ensues, "approaching the light of the sun in unsurpassed purity and splendour." Its intensity is such as to prevent the eye examining it closely, but by means of a lens, the figures of the points may be projected on a screen; when thus examined the light seems due to incandescent particles of carbon floating in, and traversing the space between the points. It arises partially from the whiteness of the points, and partially from these particles, which produce a continuous flame between the points. The positive electricity is discharged from P. and the negative from N. Since in every electric current, however induced, there are these two kinds of electricity. The negative pole is said to be the brightest, while the positive pole is the hottest, for when the current ceases, and the light is extinguished, the positive pole is seen to glow, long after the other has become black.

During the maintenance of the light, the Carbon points are seen visibly to change; and the cause of this is, that particles of Carbon leave the positive pole on their way to the negative. Some of these reach the pole, others are highly heated and consumed on their way. The same process takes place in a less degree with the negative pole; Hence the positive is found to be flattened, while the negative, retains somewhat of its pointed shape.

The air between the poles is considered as a medium for the passage of the electricity, for it is not consumed by the electricity, but solely by Chemical action, and in a partial vacuum the light is more intense. The discharge of electricity in a vacuum or in rarefied gases or vapours, produces the most beautiful effects of colour, and stratification of light, which were investigated by Geissler of Bonn, who made tubes filled with different gases very highly rarefied. They have platinum wires sealed into the ends to serve as electrodes. Such substances as uranium glass, Hydrogen, Sulphate of quinine, &c., are introduced into these tubes, for the sake of the brilliant effects they produce.

The transference above mentioned, causes a wasting away, particularly of the positive pole, and in a short time it renders the distance between the poles too considerable to allow of the passage of the electricity. Where a

continuous light is required, this might be a drawback; but to obviate it, various regulators have been invented, so as to ensure a continuous light, to which I shall afterwards refer.

The heat of the voltaic arc is the most intense that can be produced Platinum melts in it like wax in the flame of a candle. Quartz, the sapphire, magnesia, lime, and other very infusible substances are forced by it into a state of fusion. The Diamond when placed in it becomes fused, swells up, changes colour, consistency, and specific gravity, and though still hard enough to scratch glass, is plastic to the touch; it then resembles coke in colour and appearance.

The Electric light is found to be abundant in the violet or chemical rays, as seen by the spectrum, and is for this reason well adapted for photographic purposes; it is also used for registering automatically the movements of the mercury of thermometers at observatories. The Chemical change produced on a photographic plate is due to the violet and to the invisible rays beyond the violet, which are called the Chemical or ultra violet rays. They may be rendered visible by *fluorescence*, on which a very interesting paper was read to you last term.

This light may be rendered very useful for diving purposes, since it is readily produced under water, though with rather less brilliancy. With a battery of fifty cells, a brilliant light is produced, but when power is required as well as brilliancy, a battery of three or four times this size must be employed.

The voltaic arc is acted on by a magnet, according to the same laws as any other electric current. M. Quet by employing a very powerful electro magnet, with its poles at equal distances on opposite sides of the line joining the points, repelled the arc laterally to such an extent that it resembled the flame of a blowpipe.

Attempts were made long ago to utilize the brilliancy of this light, but the failures of these attempts was due not so much to its greater costliness as compared with other ordinary sources of illumination, as to the difficulty of using it effectually. Its brilliancy is painfully intense, sometimes producing headaches, and even all the effects of sunstrokes, viz., temporary aberration, intense thirst, giddiness and like ailments. Its small size detracts from its illuminating power, it dazzles rather than illuminates, and it cannot be produced on a sufficiently small scale for ordinary purposes of convenience. There is no mean between the absence of light and a light overpoweringly intense. There is, however, one application where these peculiarities are positive advantages, namely, where great power of penetration is required. I mean that its character essentially renders it suitable for the illumination of light-houses. Here the light is not required so much to render other objects visible as to be itself seen, and in hazy, or even in clear weather, it far

supersedes all kinds of oil lamps, and even the Drummond light, which is second to none other but the electric light. The Drummond light is produced by the impinging of a jet of mingled Hydrogen and Oxygen, on a surface of lime, which is rendered intensely hot and glows with a peculiar white light.

Now the use of a number of cells for such a purpose is eminently inconvenient, from its cumbersome nature, and the amount of trouble which would be required. The wonderful discovery of electro-magnetism by Oersted led up to that of magneto-electricity, which latter is applied to the purpose of producing, at little trouble, the required light.

I spoke before in connection with the ball-tower, of electro-magnetism, which I shall now try to explain.

The first experiments in electro-magnetism were made by Hans Christian Oersted, who in 1819 published the results of them under the title of *Experimenta circa Efficaciam Conflictus Electrici in acum Magneticam.* This discovery obtained for him the Copley medal from the Royal Society, and the principal Mathematical prize from the Institute of Paris.

Electro-magnetism includes all phenomena where electricity gives rise to magnetism. The most important result of this power is the electro-magnet.

An electro-magnet consists usually of a bar of soft iron, bent into the shape of a horseshoe. Around its extremities are coiled helices of copper wire, or wire of other conducting material. The ends of the wires are connected with a battery, and on passing a current through them, the bar of iron becomes a powerful magnet. When the current ceases the power disappears as suddenly as it came. Much greater power can be obtained from electro-magnets than from ordinary magnetized bars. *Dr. Joule* has made small magnets which supported 3,500 times their own weight, a feat immeasurably superior to any that could be performed by an ordinary magnet. The magnetism thus induced, is proportionate to the strength of the current and the number of turns in the helices of wire. The poles of the magnet may be easily changed by reversing the direction of the current. Hence, machines have been made to produce a continuous current of electro-magnetism; these take advantage of the facility with which the poles may be reversed, and the repulsions and attractions of a keeper or amateur may be so arranged as to keep up a continual rotation. There is a large variety of these machines, but the principle of their working is as follows:—

N.S. is a fixed permanent magnet or electro-magnet. (Fig. 3.) The electro-magnet N.S. is fixed to the axis e.e., and the ends of the coil are soldered to the ring C, round a projection on the axis. The ring has two separate portions divided by slits filled with some non-conducting substance as gutta-percha, and the halves are thus insulated from each other. Pressing on the opposite sides of this ring are two springs, a.b. which by the binding

screws, are connected with wires proceeding from the battery. In this position the current is supposed to pass along a to the half of the ring in connection with the end f of the coil; thence it passes through the coil by g to the other half of the ring, whence by b it returns to the battery. The magnetism induced by the current in the electro-magnet makes S a South and N a North pole by virtue of which N attracts S, and S attracts N. By this attraction n.s. is brought into a line with N.S. and it would there stop, At this moment, however, the springs pass the slits and each touches the portion the other had, the reversed current thus reverses the poles, repulsion between the magnets ensues, and n.s. is driven on through a quarter of a revolution; attraction as before takes place between opposite poles, the magnets are again in line, repulsion once more follows and so a continual motion is kept up.

Now you might suppose that perpetual motion could be thus produced, but if you think for a moment you will see that it is not so. The essential character of perpetual motion is, that no external power be supplied. Here it is not the case, for to keep your battery going, you must supply Sulphuric acid, water, and metal as fast as they consume.

This machine then may be called our ideal electro-magnetic machine.

Many attempts have been made to utilize this force for machinery, but it is found to be too expensive and weak, except for experimental purposes.

Magneto-electricity, which you must not confound with electro-magnetism, includes all phenomena where magnetism gives rise to electricity. Magneto-electricity may be best understood thus: (Fig. 4). NS is a permanent horse shoe magnet, and let us suppose it to be fixed, CD is a bar of soft iron, with coils, AB, wound round its ends. CD is capable of rotation about its axis EF. So long as CD remains in the position seen, no currents are induced in the surrounding coils. The moment that the poles of CD leave NS, as the distance between the magnet and the bar of iron increases, the magnetism of the soft iron diminishes, and when it stands at right angles to the magnet, its own magnetism has entirely disappeared. The diminution of magnetism during its passage is attended by an electric current, which may be shown by joining e.e. with a galvanometer. During the 2nd quarter-revolution, the magnetism increases till it reaches its maximum when D has arrived at C, and as before, this increase is attended by an electric current, which proceeds in the same direction, for though the magnetism increases instead of diminishes, which of itself would reverse the induced current, the poles of the revolving armature have also been reversed, in that their position with respect to the poles of the permanent magnet has been changed, and this double reversion leaves the current to move has before. *Thus, in one revolution of a soft iron armature in front of the poles of a permanent magnet, two currents are induced in the coils encircling it, in opposite directions, each lasting half a revolution, starting from the lines joining the poles.*

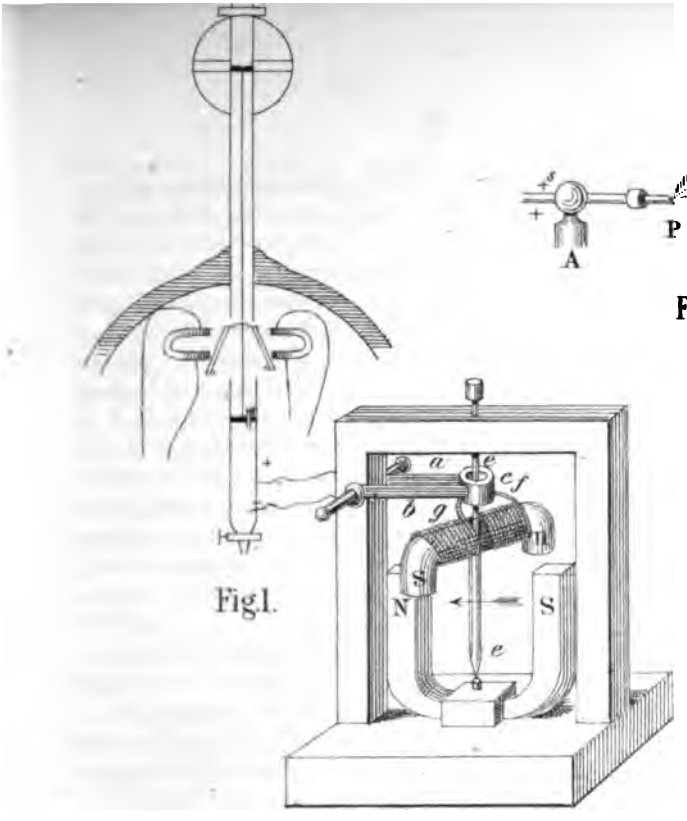


Fig.I.

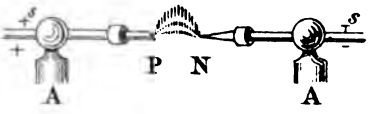


Fig.II.

Fig.III.

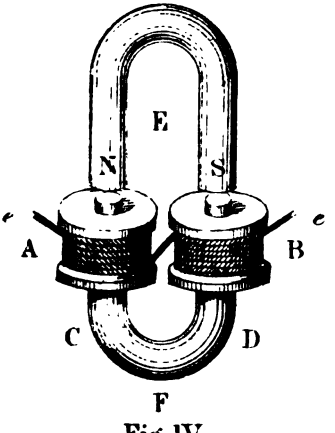


Fig.IV.

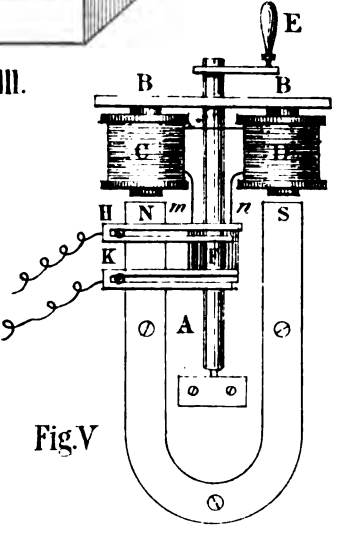


Fig.V

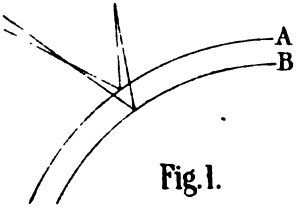


Fig.I.

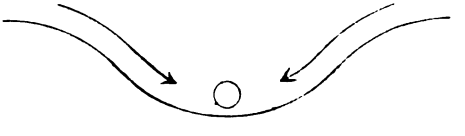


Fig.II.

The general construction of a Magneto-electric machine (Fig 5) is this. NS is a fixed permanent magnet. BB a soft iron plate, to which are attached two cylinders of soft iron, round which the coils CD are wound; CBBD is thus the revolving keeper or armature. A is a brass axle rigidly connected with the armature. F is a cylindrical projection on the axle, and is pressed on by two fork-like springs H, K, which are also the poles of the machine. The ends m, n, of the coil, are soldered to two metal rings on F, insulated from each other. When the armature revolves A and F move with it. F, H and K are so arranged as to act as a commutator reversing the current at each half-revolution. By this arrangement, the opposite currents proceeding from the coil, are transmitted to H, K, in the same direction, which remain always of the same name. By this I mean that the North pole remains North and is never reversed, and the same with the South pole. When the armature is made to revolve with sufficient rapidity, a very energetic current is obtained. This then may be taken as our ideal magneto electric machine.

These are chiefly used in lieu of batteries, for obtaining very strong currents, also for medical purposes.

We have not now time to relate the various improvements introduced by such as, Clark, Pixii, Wilde, and others, but I will now describe the immense machine used for lighthouses.

Machines were first adapted for this purpose by Professor Nollet, of Brussels, and I believe the first lighthouse of this kind was placed on the Cape de la Héve.

The machine as adopted by the French Company, (Compagnie D'Alliance) has eight rows of compound horse shoe magnets, fixed symmetrically round a frame of cast iron. They are so placed that opposite poles always succeed each other. There are seven of these circular sets, and in the six intervening spaces are six bronze wheels, which revolve on a common axis driven by a small steam engine of low horse-power. The speed of rotation in an English house is 400 revolutions of the axis per minute. Each of the bronze wheels carries at its circumference 16 coils corresponding to the number of poles in each set. The core of each coil is a cleft tube of soft iron, this from various experiments having been found the most suitable form. Each core has its magnetism reversed sixteen times in each revolution, by the influence of the sixteen successive pairs of poles, and the same number of currents in alternately opposite directions, is generated in the coils, the positive ends of which are connected with the axis, while a concentric cylinder carefully insulated from the axis serves to conduct the negative electricity.

Five minutes before astronomical sunset every day, these machines are set in motion and the current is turned on, and the carbons lit at the exact

moment of sunset; the light is kept on till sunrise, and 5 min. after sunrise the machine is stopped. In case of accident, Argand lamps are provided beforehand.

There seems to be no kind of regulation of the amount of light, for, seen from a distance, the electricity "jerks" so that the light almost seems to flash.

The points are made of a peculiar carbon mixture, for which we are indebted to Professor Bunsen, of Heidelberg, who invented a process whereby Carbon of the required density may be manufactured with ease and economy. The Bunsen carbons as manufactured in Germany, are of a cylindrical shape and hollow, while those used for English lighthouses are solid rectangular prisms.

Two parts of coke and one of baking coal are ground to a fine powder and passed through a sieve. This powder is then placed in moulds of iron, luted with clay; when the moulds are filled, they are placed in a furnace, till all Carburetted Hydrogen (CH_4) has escaped from them; they are then taken out and allowed to cool before the mass inside is removed, which is found when cold to be perfectly hard and capable of being ground, cut, or sawn to the proper dimensions. But even then the carbons are destitute of electrical action, and their density must be increased. This is done by soaking them thoroughly in gas tar; they are then laid aside to dry; when dry they are packed with charcoal dust in crucibles, and for the second time exposed to great heat for a considerable period. If their density is not then sufficient, the latter processes may be repeated.

I mentioned above the change that takes place in the carbons, and the wasting away of the points through combustion. Now when the points are at a certain distance from each other, the electricity will not pass, and the light goes out; this would happen often in a single night, and to obviate this apparent disadvantage several regulators have been invented to keep the carbons at the proper distance, neither too near nor too far from each other. So great indeed is this wasting, that I am told in the short nights of summer, more than 5 feet of carbon is consumed. The regulators are driven by clockwork, a system of wheels, one of which contains a spring coiled within a barrel like a watch-spring, and modulated by what are called revolving fans, such as you may see in musical boxes. They are so arranged that the shaft carrying the positive carbon shall move more quickly than that carrying the negative, if the carbons are fed by a battery. If, on the other hand, a magneto-electric machine, such as I have described, be used, each carbon becomes alternately positive and negative, and the velocities of the shafts must be equal.

When the current passes into its full strength, an armature connected with the machinery is held down by an electro-magnet created by the current itself, so as to stop the wheels; as the carbons burn away the resistance increases, and the strength of the current decreases, till an opposing spring is able to

overcome the magnet and release the armature; this in turn releases the locking-wheel or pallet, and the carbons are driven forward by the main-spring, thus increasing the current, till the magnet again acquires sufficient power to attract the armature and stop the machinery. A lever is provided for starting and stopping the machinery, and the armature may be adjusted to the strength of the battery or Magneto-electric machine.

ON SOAP-BUBBLE SPECTRA.

By A. E. Garrod.

You may remember that last term I read before this Section a short paper on the Spectra of Polarized Light; the phenomena of which I am going to speak in the present paper are very analogous to those therein described. (N.H.S. Report, Midsummer, 1875, p. 58).

If you look at the light reflected from the surface of a soap-bubble, with a spectroscope, you will see a spectrum which will at once strike you as very much resembling a Polarized light spectrum, but you will at once notice one important difference, viz., that whereas the lines in the Polarized light spectrum are fixed in one position, those in the soap-bubble spectrum are constantly moving with a sort of flickering motion; now towards the red end of the spectrum, and now towards the violet; the bands however are seen to be distributed at regular intervals, and that we know is a sure sign that it is an interference spectrum; we must pause now to consider how the soap-bubble colours are produced.

Athough the soap-bubble film is of such extreme thinness, it of course has two surfaces, an outer surface (*A*), and an inner surface (*B*), and a ray falling upon this film is partially reflected at the outer surface, but the remainder of the light passes through to the second surface, and is reflected there, and again emerges from the film, and falls in with the light reflected from the outer surface, but that portion of the light which has passed through to the second surface, has had further to go than that reflected from the outer suface, and is slightly retarded; if this retardation amounts to half a wave length, we obviously have the conditions of interference, and according to the thickness of the film, and the consequent amount of retardation, the colour produced varies, and as in the case of selenite plates, we get a spectrum furrowed by dark bands, distributed regularly throughout the spectrum, and as the thickness of the film increases the number of bands increases, and as their number increases their breadth decreases, according to the law given in my paper on the spectrum of Polarized light,

viz., the breadth of the bands increases inversely as their number, or in other words, if we double the number of bands we halve their breadth. The increase of bands as the thickness increases, is due to the fact, that if you have a comparatively thick film, besides those rays which differ half a wave length, you have others which differ 1½ wave length, or 2½ wave lengths, or any other odd number of half wave lengths, but it can never happen that all the colours save one are extinguished, and consequently neither soap-bubble, or selenite colours are ever pure or monochromatic. Newton calculated by means of his rings the thickness required to produce the different colours in a soap-bubble, these, you will notice, are much less than those requisite to produce the same colours in a selenite plate.

The following table gives the requisite thicknesses for three different colours, one from each of the first three series of colours. The first column gives the colours produced; the second, the number of bands shewn; the third, the thickness of the film of water needed to produce that tint; the fourth, twice that thickness as the ray passes twice through the film; and the fifth, the thickness of selenite required to produce the same colour.

Colours of Film.	No. of Bands.	Thickness of Film.	Twice thickness of Film.	Thickness of Selenite.
Orange Yellow ...	1	$\frac{1}{0\,0\,0\,\frac{6}{0}\,0\,0\,0}$	$\frac{1}{0\,0\,0\,\frac{6}{0}\,0\,0}$	$\frac{1}{3\,0\,0}$
Bright Red	2	$\frac{1}{0\,0\,0\,\frac{1}{0}\,\frac{1}{0}\,0\,0}$	$\frac{1}{0\,0\,0\,\frac{1}{0}\,\frac{1}{0}\,0\,0}$	$\frac{1}{1\,5\,0}$
Pale Red	3	$\frac{1}{0\,0\,0\,\frac{5}{0}\,\frac{7}{0}\,0\,0}$	$\frac{1}{0\,0\,0\,\frac{5}{0}\,\frac{7}{0}\,0\,0}$	$\frac{1}{1\,0\,0}$

The thicknesses are in fractions of an inch.

We will now proceed to study the motions of the spectrum bands, and the effects produced on them by external and internal agencies.

If, instead of leaving our soap-bubble exposed to the currents of air, we enclose it under a glass shade the oscillation of the bands will be greatly diminished, and when the soap-bubble is tolerably at rest, being supported upon a ring of wire, which is kept wet, we notice that there is a general drift of the bands towards the violet end, indicating a decrease in the thickness of the film. I wanted to find the rate at which these bands move towards the violet, and it was therefore necessary to have a fixed scale; and therefore I adjusted a prism of comparison to my spectroscope, and by means of it was able to have two spectra side by side, for comparison; as the spectrum of comparison I employed a ten-band polarized light spectrum, and the space between two bands in this spectrum I shall afterwards call

unit distance; although I was unable to obtain any definite result owing to unavoidable currents, &c., in the film, it added some interest to the experiments. A band travels over the unit distance in periods varying between two and ten seconds. There may be some law with respect to the motion, but other movements in the film have prevented my getting satisfactory measurements. The bubble when thus kept quiet presents most beautiful appearances, the colours arranging themselves in rings, with a black spot, where the delay is too small for any interference at the vertex of the bubble.

If the bubble be blown and placed upon a wire ring, as described, in bursting it does not always break into atoms, but shrinks down, and in these cases, the bands in the spectrum move briskly towards the red, indicating an increase of thickness due to this shrinking. If we keep a tube in connection with a bubble whilst examining its spectrum, when we blow into the bubble the bands move towards the violet, indicative of a decrease in the thickness of the bubble, and on the other hand if we draw air out of the bubble, the bands move towards the red, and increase in number, indicative of an increase in the thickness, and if a hemispherical bubble be blown over a basin, if the exhaustion be carried so far that the surface of the bubble is a plane, we get sometimes as many as twenty bands. The more quickly a bubble is blown the greater number of bands it exhibits, as the film has less time to decrease, owing to draining off from the top. And small bubbles if blown from the same solution, under the same circumstances, always have more bands than large ones, as the same amount of liquid is distributed over the same amount of surface. There are always currents of liquid moving in the film, which causes the bands to oscillate in the spectrum, this is due to air currents and such like causes, and at the moment when the tube is separated from the bubble, great disturbance is produced, which does not subside for a considerable time.

I now come to the action of external agencies upon the bubble; if a spirit lamp flame be brought near to the side of the bubble considerable disturbance is produced, which is shewn by the lively oscillation of the bands towards the two ends of the spectrum, and if the lamp be held there long enough the water is vaporized, and the bubble bursts, the disturbance is due to convection currents, the heated liquid tries to rise into the higher parts of the film, and a regular series of currents is thus established.

Similar effects may be produced by blowing a current of air along the surface of the bubble, it blows the liquid before it, causing an increase of thickness in the parts towards which the current of air is directed. I daresay you have noticed that if you let a drop of water fall upon a soap-bubble, the drop passes through the bubble without producing any apparent effect,

now if we direct the spectroscope to the point where the drop enters, you notice that as the drop passes through the bands move towards the red, indicating an increase in the thickness of the film; this motion is very small amounting usually to half the unit distance; the unit distance as I said being the distance between two bands of a ten-band selenite plate; now this increase in thickness is probably due to two causes, firstly, to the fact that the impact of the drop produces a depression, into which the liquid from the surrounding portions of the film flows; and secondly, the film would take up part of the liquid from the drop, but the depression on first impact, produces a decrease in thickness of the film, but this I have not yet been able to detect by the spectroscope; but if a too rapid succession of drops is allowed to fall on the film it is quickly ruptured. I tried to repeat this experiment with ether, because its impact would be less forcible, as it is lighter than water, but I found that the impact of the ether drop invariably produces a rupture of the film. The ether seems literally to tear a hole in the film, this may be rendered less remarkable if you look at the action of a drop of ether floating on the surface of water, where it behaves in a most peculiar manner, spinning round, and presenting the appearance of a movement of ciliæ, such as you see in microscopic animalculæ.

This brief sketch has entered but superficially into these phenomena of the soap-bubble, and a great deal remains to be done, and I will conclude by expressing a hope that this paper may arouse in some of you a desire to investigate these phenomena further for yourselves, the only apparatus necessary being a spectroscope and a soap-bubble, or a single prism and slit may even be substituted for the spectroscope.

THE ORNITHOLOGICAL SECTION.

MEMBERS.—G. H. Dawson, Esq., (Head).
R. Armitage.
C. E. Blackett-Ord.
E. S. Marshall.
T. G. Balfour.
G. P. V. Hume.
E. W. B. Jones.
G. Rogers.
M. Rogers.

The 1st Sectional Meeting was held on October 6th.—A paper was read by T. G. Balfour, on the Distinction of Species. Among other interesting remarks, he hazarded a theory that there were two species of the British Wren, as he had seen several specimens with blue feathers on their wings.

The 2nd Sectional Meeting was held on October 20th—A paper was read by R. Armitage on the anatomy of a Hawk, with a few remarks on plumage.

The 3rd Sectional Meeting was held on November 17th.—A paper was read by C. E. Blackett-Ord, on Grouse. A Merlin, which was shot near Ramsbury was exhibited. After the meeting, C. E. Blackett-Ord was requested to allow his paper to appear in the next report.

The last meeting was held on Dec. 1st, when E. S. Marshall read a paper on Ducks, which also he promised to insert in the report. The sectional meetings have been well attended this term, and several interesting discussions and descriptions of anecdotes have occurred after the papers.

ORNITHOLOGICAL NOTICES.

By E. Marshall and T. G. Balfour.

Sept. 24th.—Sand Martins, seen, T.G.B.

„ 29th.—House Martins, young, T.G.B.

Oct. 5th. —Chiff-chaff, heard, E.M.

„ 15th.—Little Grebe, winter plumage, E.M.; Fieldfare, seen, E.M.

„ 16th.—Marsh Tit, seen, E.M.

„ 22nd.—Buzzard, shot in Overton Dell, by Mr. Price's gamekeeper.
Coot, seen, E.M.

„ 24th.—Coot, seen, T.G.B.

Nov. 3rd. —Swallows, last seen in numbers, E.M. and T.G.B.

„ 7th. —Heron, captured at Axford, *Mr. Coleman*.

„ 11th.—Redwing and Tree Sparrow, seen by E.M.

„ 12th.—Grey Wagtail, seen in Love Lane, T.G.B ; Two Coots seen, T.G.B.

„ 15th.—Water Rail, seen, E.M.; five Swallows, seen, *H. T. Lucas*.

„ 16th.—Water Rail, seen on river opposite Botanical Garden, E.M.

„ 91th.—Swallow, seen, *G. H. Dawson, Esq.*

„ 20th.—Martin, seen, E.M.

„ 30th.—Swallow, in Adderley Library, *R. Armitage*.

Dec. 3rd. —Bramblings, plentiful, E.M. During the frosty weather which occurred about this time, large quantities of teal, widgeon, wild duck, snipe, &c., visited the river about East and West Kennett, and large quantities of Bramblings were seen on the farms bordering on Savernake Forest. *Mr. Coleman*.

„ 6th. —Marsh Tit, caught, E.M. and T.G.B.

„ 9th. —Heron, found dead at Mildenhall.
Two Snipe, seen.
Large flock of Peewits seen in the water meadows.
Flock of 20 or 30 Wagtails, seen, E.M. and T.G.B.

„ 11th.—Forty Snipe with a few Jack Snipe, seen at Mildenhall, E.M. and T.G.B.

A Merlin was shot at Ramsbury in January, 1875. The specimen is now in the Museum.

ENTOMOLOGICAL NOTICES.

THE following have been kept by N. Manders, and include all the species taken this Term. The most noteworthy being *C. Edusa*, of which several specimens have been captured, during August and September; *A. Iris* seen near the College Bathing Place; *G. C-album*, caught near the Forest, the first specimen captured since the foundation of the Society, though a specimen was captured in 1863 by E. H. Manders; and last, but not least, *S. Convolvuli*, of which one specimen was captured in the High-Street and presented to the College collection by B. V. Melville. Three other specimens have been brought here by Mr. Mould, of Pewsey, who also states that he had taken 2 more (which he supposed were *A. Atropos*) but had been thrown away accidentally.

Names of those whose initials occur in the List:—

H.B.—H. BOND. B.V.M.—B. V. MELVILLE. S.P.—S. PEARSE. S.S.—S. SMITH. N.M.—N. MANDERS. C.P.—C. PEARSE. W.M.R.—W. M. RICHARDS. A.K.W.—A. K. WARD.

RHOPALOCERA.

Gonepteryx Rhamni ...	Common	Aug. 14th, N.M.
Colias Edusa (1 fem.) ...	London Hill	Sep. 14th, C.P.
„ (1 male) ...	London Hill	Aug. 27th, S.P.
„ (1 male) ...	Railway Bank... ...	Sep. 7th, N.M.
„ (3 males) ...	„	Sep. 9th, H.B., N.M.
„ Hyale or Helice—*seen*	„	Sep. 9th, H.B., N.M.
Pieris Brassicæ	Common	July 30th, N.M.
„ Rapæ	„	„ N.M.
„ Napi	„	„ N.M.
Arge Galathea	Rabley...	Aug. 9th, N.M.
Lasiommata Ægeria ...	Forest	Aug. 30th, N.M.
„ Megæra ...	Common	Aug. 29th, N.M.
Hipparchia Semele ...	Forest Hill	Aug. 6th, N.M.
„ Janira ...	Common	Aug. 3rd, N.M.
„ Tithonus ...	„	„ N.M.
„ Hyperanthus	„	„ N.M.
Cœnonympha Pamphilus	„	Aug. 1st, N.M.
Apatura Iris—*seen* ...	College Bathing Place	Sep. 6th, N.M., A.K.W.
Cynthia Cardui	Railway Bank... ...	Sep. 13th, S.P.
Vanessa Atalanta ...	Commoner than usual	Aug. 29th, N.M.
„ Io	Common	Aug. 21st, N.M.
„ Polychlorus ...	Scarce	Sep. 5th, N.M.
„ Urticæ	Common	Sep. 1st, N.M.
Grapta C-album ...	Forest	Aug. 20th, P.S.

Argynnis Paphia ...	„	Aug. 11th, N.M.	
„ Aglaia... ...	„	„ N.M.	
„ Adippe ...	„	„ N.M.	
Thecla W-album ...	Froxfield Road ...	July 31st, N.M.	
Chrysophanus Phlæas ...	Common	Sep. 5th, N.M.	
Polyommatus Corydon ...	Rabley...	July 31st, N.M.	
„ Alexis ...	Common	Aug. 10th, N.M.	
„ Agestis ...	Forest	Aug. 11th, N.M.	

A White Butterfly was seen by T. G. Brown as late as Nov. 18th.

HETEROCERA.

Smerinthus Ocellatus ...	pupa	Sep. 3rd, S.P.
„ Populi ...	... ...	Aug. 10th, *Mr. Coleman*
	pupa	Oct. 15th, N.M.
„ Tiliæ ...	„	Oct. 17th, N.M.
Sphinx Convolvuli ...	Marlborough	Sep. 25th, B.V.M.
	Pewsey	1 by Oct. 2nd, Mr. Mould
	„	2 by Oct. 9th. „
„ Ligustri... ...	larva	Sep. 11th, *Mr. Coleman.*
	pupa	Sep. 30th, N.M.
Diloba Cæruleocephala...	... ...	Oct. 6th, W.M.B.
	bred	Oct. 19th, H.B.
Pygæra Bucephala ...	pupa	Sep. 3rd, N.M.
Scopelosoma Satellitia ...	... ...	Dec. 8th, S.S.
Phlogophora Meticulosa	Pewsey	Oct. 2nd, *Mr. Mould.*
	bred	Oct. 22nd, H.B.
Cheimatobia Brumata ...	plentiful	Dec. 28th, N.M.

A Cockchafer was seen as late as Dec. 8th by N.M.

The following notices are supplied by E. Meyrick, Esq.

NOCTUINA.

AGROTIS AQUILINA ...	Thrup	Sept. 5th.

TORTRICINA.

DICROBAMPHA CONSORTANA	Bedwyn Brails ...	July.
CARPOCAPSA JULIANA ...	Savernake Forest ...	July.
ONEPHASIA NUBILANA ...	Ramsbury	July.

TINEINA.

CHIMABACCHE PHRYGANELLA	Thrup	Oct. 8th.
ELACHISTA SUBNIGRELLA	Boltsridge	June.

Some of the above species have been known as occurring for some time, but do not seem to have been previously recorded.

CORRIGENDUM.

Halonota Inopiana is to be struck out of our lists, having been wrongly inserted.

COLEOPTERA.

The following sixteen species are new to our lists.

GEODEPHAGA.

Nebria brevicollis	abundant.
Amara acuminata	Ramsbury.
Bradycellus fulvus	common.
Trechus minutus...	abundant.

NECROPHAGA.

Necrophorus humator	Ramsbury.
N. vespillo	Thrup.

MALACODERMI.

Anthocomus fasciatus	Ramsbury.
Tillus elongatus	Ramsbury.
Ptilinus pectinicornis	Ramsbury.

RHYNCHOPHORA.

Apoderus coryli	Thrup.

LONGICORNES.

Gracilia pygmaea	Ramsbury.

PHYTOPHAGA.

Donacia sericea	Axford.
Cryptocephalus aureolus	Martinsell.
Chrysomela varians	Henswood.
C. haemoptera	Henswood.
Gastrophysa raphani	Ramsbury.

C. aureolus was discovered by R. A. Farrar.

BOTANICAL NOTICES.

Not much has been done in the Botanical line this term, but by the help of the Rev. J. Sowerby, lists of the plants in flower at different dates have been procured.

The two important additions, or rather re-discoveries, are *Sagina nodosa* found near Rabley Copse by W. H. Macdonald, Esq.; *Thesium humifusum*, on Rabley Down.

Other notices worth recording were :—

Cuscuta europæa (?) ...	Sep. 29th... ...	H. W. Thatcher.
Hedera Helix	by Oct. 14th ...	
Rosa arvensis	Oct. 22nd... ...	E. H. H. Eden.
Tussilago fragrans... ...	Dec. 22nd ...	E. F. im Thurn, Esq.
Ruscus aculeatus	Dec. 26th... ...	F. E. Thompson, Esq

Stachys arvensis has been detected at Wootton Rivers, and between Marlborough and Savernake.

Reseda luteola, on the Railway Bank, Savernake.

As regards the defoliation of trees, it may be observed that the leaves remained on the trees for a very much longer time than usual.

Æsculus Hippocastanum	Horse Chestnut ...	Leafless, Nov. 1st.
Fagus Sylvatica	Beech	Leafless, Nov. 8th.
Tilia Europæa	Lime	„ „
Ulmus Montana	Elm	some still green, Nov. 10.
Quercus Robur	Oak	„ „
Acer Campestre	Field Maple ...	„ „

The Mulberry was not defoliated till 26th Nov.

The following list gives a pretty accurate list of the plants in flower on Oct. 14th and 16th (marked O), 178 in number, and those observed between Oct. 29th and Nov. 6th (marked N), 69 in number, both lists obtained by Rev. J. Sowerby.

Ranunculus
- penicillatus ..... o
- acris..... o n
- repens ..... o n

Papaver
- rhœas ..... o n

Chelidonium
- majus ..... o

Fumaria
- officinalis..... o

Nasturtium
- officinale ..... o n

Sisymbrium
- officinale ..... o n

Brassica
napus ..... o
Sinapis
arvensis ... . o n
alba ..... o n
Lepidium
campestre ..... o
Capsella
bursa-pastoris ... o n
Senebiera
coronopus ..... o
Raphanus
Raphanistrum ... o
Reseda
lutea ..... o
luteola ..... o
Helianthemum
vulgare ..... o
Viola
arvensis ..... o
Polygala
vulgaris ..... o
Lychnis
vespertina ..... o
diurna ..... o n
Arenaria
serpyllifolia ..... n
Stellaria
media ..... o n
graminea ..... o n
Cerastium
glomeratum ..... o
triviale ..... o n
Malva
moschata ..... o n
sylvestris ..... o n
rotundifolia ..... o
Hypericum
perforatum ..... o
Geranium
pratense ..... o
dissectum ..... o n
columbinum ..... o n
molle ..... o n
Robertianum ..... o n
Ulex
Europæus ..... o n
Medicago
lupulina ..... o n
Trifolium
pratense ..... o n
*incarnatum ..... o
arvense ..... o
repens ..... o
procumbens ..... o
minus ..... o
Vicia
hirsuta ..... o
sepium ..... o n
Onobrychis
sativa ..... o
Spiræa
Ulmaria ..... o
Agrimonia
eupatoria ..... o
Potentilla
reptans ..... o
Tormentilla ..... o n
Rubus
discolor ..... o n
cæsius ..... o
Geum
urbanum ..... o
Rosa
arvensis ..... o
Epilobium
angustifolium ..... o
parviflorum ..... o
montanum ..... o n
Spergula
arvensis ..... o
Pimpinella

saxifraga ..... o n
Æthusa
cynapium ... . o n
Angelica
sylvestris ... . o
Heracleum
sphondylium ..... o n
Daucus
carota ..... o
Chærophyllum
temulum ..... o n
Hedera
Helix ..... o n
Lonicera
Periclymenum ... o
Sherardia
arvensis ..... o
Galium
Aparine ..... o
Mollugo ..... o n
verum ..... o
Valerianella
olitoria ..... o
Knautia
arvensis ..... o n
Scabiosa
succisa..... o n
columbaria ..... o n
Erigeron
acris..... o
Bellis
perennis ..... o n
Solidago
virgaurea ..... o
Achillea
Millefolium ... ... o n
Anthemis
cotula ..... o
Matricaria
inodora ..... o n
Chrysanthemum
segetum ..... o
Tanacetum
vulgare ..... o
Filago
germanica ..... o
Gnaphalium
uliginosum ..... o n
Senecio
vulgaris ..... o n
Jacobæa ..... o n
aquaticus ..... o
Arctium
intermedium ..... o
Centaurea
nigra ..... o n
cyanus ..... o
scabiosa ..... o
Carduus
nutans ..... o n
crispus..... o n
lanceolatus ..... o
arvensis ..... o n
palustris ..... o
acaulis..... o n
Lapsana
communis ..... o n
Hypochœris
radicata ..... o
Picris
hieracioides ..... o
Apargia
hispida ..... o n
autumnalis ..... o n
Leontodon
taraxacum ..... o n
Sonchus
oleraceus ..... o n
asper ..... o n
arvensis ..... o
Crepis
virens ..... o n

Hieracium
pilosella ..... o
vulgatum ..... o n
boreale ..... o
Campanula
glomerata ..... o n
rotundifolia..... o n
patula ..... o
Calluna
vulgaris ..... o
Erythræa
centaurium..... o
Gentiana
campestris ..... o
Convolvulus
arvensis ..... o
sepium ..... o
Cuscuta
europæa ..... o
Lycopsis
arvensis ..... o
Symphytum
officinale ..... o
asperrimum ..... o
Echium
vulgare ..... o
Myosotis
palustris ..... o
arvensis ..... o n
Verbascum
Thapsus ..... o
Linaria
vulgaris ..... o
Scrophularia
aquatica ..... o n
Veronica
Anagallis..... o
serpyllifolia ..... o n
arvensis ..... o
polita ..... o n
Buxbaumii ..... o n
Mentha
aquatica ..... o
Origanum
vulgare ..... o
Thymus
serpyllum ..... o
Calamintha
clinopodium ..... o
Prunella
vulgaris ..... o
Nepeta
Cataria..... o
Lamium
amplexicaule ..... o
purpureum ..... o n
intermedium ..... o
album ..... o n
Galeopsis
Ladanum ..... o
Stachys
Betonica ..... o n
sylvatica ..... o n
arvensis ..... o
Ballota
fœtida ..... o
Anagallis
arvensis ..... o n
Plantago
lanceolata ..... o
Rumex
sanguineus ..... o
obtusifolius..... o
crispus..... o
Polygonum
Persicaria ..... o
aviculare..... o
convolvulus ..... o
Euphorbia
Peplus ..... o
exigua ..... o
Urtica

urens .. .. o
Spiranthes
autumnalis ..... o
Phleum
pratense ..... o
Holcus
lanatus ..... o
mollis ..... o
Trisetum
flavescens ..... o
Arrhenatherum
avenaceum ... . o
Poa
annua ..... o n

Glyceria
fluitans ..... o
Cynosurus
cristatus .... o
Dactylis
glomerata ..... o n
Brachypodium
sylvaticum ..... o
Bromus
erectus..... o
Serrafalcus
mollis ..... o
Lolium
perenne ..... o n

COLLECTION OF BIRDS

IN THE

SOCIETY'S MUSEUM.

	Eggs.	Stuffed.	Skins.	Skeletons.	Breast Bones.
Buteo vulgaris—Common Buzzard	1	1 Salisbury Plain.			
Archibuteo lagopus—Rough-legged Buzzard ...	1				
Aquila chrysaëtos—Golden Eagle					1
Haliaëtus albicilla—White-tailed Eagle ...	1				
Falco peregrinus—Peregine Falcon	1				
Hypotriorchis subbuteo—Hobby		* Marlborough, 1872.			
Hypotriorchis aesalon—Merlin	2	† Ramsbury, 1875.			
Tinnunculus alaudarius—Kestrel	5	*†		1	1
Milvus regalis—Kite	1				
Accipiter Nisus—Sparrowhawk	5	*†			
Swinia ulula—Hawk Owl	1				
Athene noctua—Little Owl	1	1 Cornwall.			
Syrnium aluco—Tawny Owl	2	1			
Otus vulgaris—Long-eared Owl	1				
Otus brachyotus—Short-eared Owl	1	1			
Strix flammea—Barn Owl	1	1		1	
Caprimulgus europaeus—Goatsucker	4	2 Marlborough.			
Cypselus apus—Swift	3	1			
Hirundo rustica—Swallow	7	1			1
Cotile riparia—Sand Martin	2				
Chelidon urbica—House Martin	3	1			
Coracias garrula—Roller		1 Banbury.			

* Males. † Females.

	Eggs.	Stuffed.	Skins.	Skeletons.	Breast Bones.
Alcedo ispida—Kingfisher	4	2			1
Merops apiaster—Bee-Eater	2				
Upupa epops—Hoopoe		1			
Sitta europaea—Nuthatch	1	1	2		
Certhia familiaris—Tree Creeper	1				
Troglodytes parvulus—Wren	5		3		
Calamodyta schaenobanus—Sedge Warbler ...	4				
Calamodyta arundinacea—Reed Warbler ...	4				
Calamodyta luscinoides—Savi's Warbler ...	1				
Calamodyta locustella—Grasshopper Warbler ...	1				
Sylvia undata—Dartford Warbler	1				
Sylvia cinerea—Common Whitethroat	4				
Sylvia curruca—Lesser Whitethroat	1				
Sylvia sibilatrix—Wood Warbler	5				
Sylvia atricapilla—Black Cap	4				
Sylvia hortensis—Garden Warbler	11				
Sylvia trochilus—Willow Warbler	7		1		
Sylvia rufa—Chiff-Chaff	6				
Regulus cristatus—Golden-crested Wren ...	9		1		
Regulus ignicapillus—Fire-crested Wren ...	1				
Luscinia vera—Nightingale	7		1		
Ruticilla phoenicura—Redstart	5	*	*		
Ruticilla lithys—Black Redstart...	1				
Erythacus rubecula—Robin	8	1		1	
Cyanecula suecica—Blue-throated Warbler ...	1	1			
Saxicola œnanthe—Wheatear	1				
Pratincola rubicola—Stone Chat	1				
Pratincola rubetra—Whin Chat	1				
Accentor alpinus—Alpine Accentor	1				
Accentor modularis—Hedge Sparrow	6				
Parus major—Greater Tit	16	1	1		
Parus ater—Cole Tit	3				
Parus palustris—Marsh Tit	1	2 Marlborough.			
Parus cæruleus—Blue Tit	7	1			
Parus cristatus—Crested Tit	1				
Parus caudatus—Long-tailed Tit	9		1		
Aegithalus biarmicus—Bearded Tit	2				

* Males. † Females.

	Eggs.	Stuffed.	Skins.	Skeletons.	Breast Bones.
Motacilla alba—White Wagtail	1				
Motacilla Yarrelli—Common Wagtail	3		1		
Motacilla flava—Grey Wagtail	1				
Motacilla Rayi—Ray's Wagtail	6				
Motacilla boarula—Grey-headed Wagtail ...	1				
Anthus obscurus—Rock Pipit	1				
Anthus plumatus—Tree Pipit	2	1			
Anthus pratensis—Meadow Pipit	3	1			
Anthus Richardi—Richard's Pipit	1				
Turdus viscivorus—Missel Thrush	9	*†			
Turdus pilaris—Fieldfare	2	*†2			
Turdus musicus—Song Thrush	5	*†1	1	1	1
Turdus iliacus—Redwing	1	*†			1
Turdus merula—Blackbird	4 semialbino	*†	1 shot at Preshute.		
Turdus torquatus—Ring Ouzel	1	*			
Hydrobata cinclus—Dipper	1	1	2		
Oriolus galbula—Golden Oriole	2				
Muscicapa grisecla—Spotted Flycatcher ...					1
Ampelis garrula—Waxwing		1			1
Enneoctonus collurio—Red-backed Shrike ...	9		1		
Lanius senator—Woodchat Shrike	1				
Garrulus glandarius—Jay	7				
Pica caudata—Magpie	6	2			
Corvus corax—Raven	1		1		
Corvus corone—Carrion Crow	2				
Corvus cornix—Hooded Crow	4	2 Marlborough.	2		1
Corvus frugilegus—Rook	5	1		1	1
Corvus monedula—Jackdaw	5				
Pastor roseus—Rosy Pastor		1			
Sturnus vulgaris—Common Starling	4		*†		
Fringilla cœlebs—Chaffinch	5	*†	*†		
Fringilla montifringilla—Brambling			1		
Fringilla carduelis—Goldfinch	1				
Fringilla spinus—Siskin	3	1			
Fringilla chloris—Greenfinch	10	*	1		
Passer domesticus—House Sparrow	7		1		

* Males. † Females.

	Eggs.	Stuffed.	Skins.	Skeletons.	Breast Bones.
Passer montanus—Tree Sparrow	1				
Coccothraustes vulgaris—Hawfinch	2 Marlb.	4 Marlb.			
Pyrrhula rubicilla—Bullfinch	5		*		
Loxia curvirostra—Crossbill		*† Monmouthshire.			
Linaria cannabina—Linnet	12				
Linaria flavirostris—Twite	1		2		
Linaria linaria—Mealy Redpole	1				
Linaria rufescens—Lesser Redpole	1	1			
Citrinella citrinella—Yellow Hammer	5	1	2		
Citrinella cirlus—Cirl Bunting			4		
Citrinella hortulana—Ortolan Bunting	2				
Citrinella miliaria—Common Bunting	5				
Citrinella schœniclа—Black-headed Bunting ...	8				
Emberiza nivalis—Snow Bunting			1		
Otocoris alpestris—Shore Lark	1				
Alauda arvensis—Sky Lark	8	young albino Calne, 1870.			
Alauda arborea—Wood Lark	1				
Alauda cristata—Crested Lark	1				
Alauda calandrella—Short-toed Lark	1				
Picus major—Greater Spotted Woodpecker ...	1	4 Marlborough.			1
Picus minor—Lesser Spotted Woodpecker ...	1	1 Marlborough.			
Gecinus viridis—Green Woodpecker	1	*† Marlborough.	1	1	1
Yunx torquilla—Wryneck	1		2		
Cuculus canorus—Cuckoo...	1	1	2	1	
Columba livia—Rock Dove	1				1
Columba œnas—Stock Dove	3				
Columba palumbus—Wood Pigeon	5		1		
Turtur auritus—Turtle Dove	1			1	1
Phasianus colchicus—Common Pheasant ...	1	*†			
Phasianus colchicus var.—White Pheasant ...		*†			
Phasianus torquatus—Ring-Necked Pheasant ...		*†			

* Males. † Females.

	Eggs.	Stuffed.	Skins.	Skeletons.	Breast Bones.
Padix cinerea—Common Partridge	7			1	
Coturnix communis—Common Quail	4	1	2		
Coturnix communis var.—Italian Quail ...		1 Marlborough.			
Caccabis rufa—Red-legged Partridge	2	2			
Tetrao urogallus—Capercailzie	2				
Tetrao tetrix—Black Grouse	2				1
Lagopus Scoticus—Red Grouse	2				
Lagopus mutus—Ptarmigan	2				1
Otis tarda—Great Bustard	2				
Oedicnemus crepitans—Stone Curlew	2	young Marlborough.			
Vanellus cristatus—Peewit	4	1	1	1	
Squatarola helvetica—Grey Plover			4		
Charadrius apricarius—Golden Plover	1	2	1		1
Charadrius thraticula—King Plover	2	2	2		
Charadrius cantianus—Kentish Plover ...	1		6		
Haematopus ostralegus—Oyster Catcher ...	3		1		1
Cinclus interpres—Turnstone			2	1	
Ardea cinerea—Heron	2	1		1	
Ardea purpurea—Purple Heron	2				
Ardeola minuta—Little Bittern	1				
Botaurus stellaris—Common Bittern		1			1
Platelea leucorodia—Spoonbill		1 Norfolk.			
Numenius arquata—Curlew	2			1	1
Limosa ægo-cephala—Black-tailed Godwit ...	2				
Limosa lapponica—Bar-tailed Godwit ...		1	3		
Totanus calidris—Redshank	2		*†		
Totanus glottis—Greenshank			1		1
Tringoides hypoleucos—Common Sandpiper ...	2	1			1
Tringoides Bartramius—Bartram's Sandpiper (?)		1			
Himantopus autumnalis—Stilt Plover ...		1			
Recurvirostra avocetta—Avocet	1				
Philomachus pugnax—Ruff and Reeve	2	*†			
Tringa maritima—Purple Sandpiper			1		
Tringa cinclus—Dunlin	1		*†1		
Tringa minuta—Little Strub			1		
Calidris arenaria—Sanderling			5		

* Males. † Females.

	Eggs.	Stuffed.	Skins.	Skeletons.	Breast Bones.
Gallinago scolopacina—Common Snipe	2	1	*†		
Gallinago gallinula—Jack Snipe...			1		1
Phalaropus fulicarius—Gray Phalarope... ..		2 Marlborough.			
Aramus aquaticus—Water Rail		2	1		1
Ortygometra crex—Land Rail	3	1			
Ortygometra porzana—Spotted Crake	1	2 Marlborough.			
Gallinula chloropus—Moorhen	4	*†	1	1	2
Fulica atra—Coot	3	**			
Anser cinereus—Tame Goose					1
Cygnus olor—Mute Swan...	2	1			
Dafila acuta—Pintail		†* Marlborough.			
Anas boschas—Wild Duck	1				
Querquedula crecca—Teal		*†* Marlborough.		1	1
Orythya ferina—Pochard...		† Marlborough.			
Bucephala clangula—Golden Eye					1
Somateria mollissima—Eider Duck	2				
Oidemia fusca—Velvet Scoter		1	*1		1
Mergus castor—Goosander		1			1
Mergus serrator—Red breasted Merganser ...		1	*†		
Mergus albellus—Smew					1
Colymbus glacialis—Great Northern Diver ...		1	1		
Colymbus arcticus—Black-throated Diver ...	1				
Podiceps cristatus—Crested Grebe	1	1			
Podiceps minor—Dabchick	7	1		1	
Chenalopex impennis—Great Auk	painted cast.				
Chenalopex torda—Razorbill	3		2		
Alca arctica—Common Puffin	1	*†1 young Marlborough.	2		
Urica grylle—Black Guillemot	1		2		
Uria troile—Common Guillemot...	3		2	1	
Procellaria pelagica—Stormy Petrel	1	2	1		
Larus canus—Common Gull	2		*		1
Larus marinus—Greater Black-backed Gull ...	1		*†		

* Ma . † Females.

	Eggs.	*Stuffed.*	*Skins.*	*Skeletons.*	*Breast Bones.*
Larus fuscus—Lesser Black-backed Gull ...	1	*			
Larus glaucus—Glaucous Gull	1				
Larus argentatus—Herring Gull	1		*†	1	
Larus ridibundus—Black-headed Gull	2				
Larus atricilla—Laughing Gull	1				
Larus minutus—Little Gull	1	1 Rookley.			
Rissa tridactyla—Kittiwake	1				1
Sterna hirundo—Arctic Tern	1		2		
Sterna fluviatilis—Common Tern	3		2		
Sterna paradisea—Roseate Tern	1				
Sterna cantiaca—Sandwich Tern	3				
Sterna minuta—Lesser Tern	1		1		
Graculus carbo—Cormorant	1		*		1
Ocyphaps lophotes—Australian Crested Pigeon		1			
Chrysolophus pictus—Golden Pheasant... ...	3	*			
Euplocomus nyothemerus—Silver Pheasant ...	3	*†			
Dromaius novae—Hollandiae Emu	1				
Australian Buzzard		1			
Laughing Jackass		1			
Cardinal Bird		1			
Spirit Duck (?)		1			
Game Cock		1			
Humming Bird and nest		1			
Cockatoo					1

Indian Skins presented by Carnegy and Spry, also Spry's Indian Eggs.

* Males. † Females.

MAXIME DESIDERATA.

STUFFED OR IN THE FLESH.

Long-eared Owl.
Red-backed Shrike
Spotted Flycatcher.
Hedge Sparrow.
Stonechat.
Whinchat.
Wheatear.
Grasshopper Warbler.
Hedge Warbler.
Reed Warbler.
Nightingale.
Blackcap.
Garden Warbler.
Whitethroat.
Lesser Whitethroat.
Wood Warbler.
Willow Warbler.
Chiff-Chaff.
Golden-Crested Wren.
Cole Tit.
Long-tailed Tit.
Pied Wagtail.
Grey Wagtail.
Sky Lark.
Common Bunting.
Black-headed Bunting.
Tree Sparrow.
Goldfinch.
Also all Ducks' Eggs.
Linnet.
Bullfinch.
Starling.
Carrion Crow.
Jackdaw.
Jay.
Wryneck.
Creeper.
Wren.
Sand Martin.
Ring Dove.
Stock Dove.
Turtle Dove.
Woodcock.

AND REQUIRE REPLACING.

Nuthatch.
Redstart.
Tree Pipit.
Meadow Pipit.
Redpole.
Siskin.
Yellowhammer.
Lesser Spotted Woodpecker.

DONATIONS TO THE MUSEUM.

Spotted Crake (*Crex Poryana*)—by H. M. Power, Esq.

Goosander (*Mergus Castor*)—by H. Dumbleton, Esq.

Three Great Northern Divers (*Colymbus Glacialis*)—by H. Dumbleton, Esq.

Shieldrake (*Tadorna Vulpanser*)—by H. Dumbleton, Esq.

Specimens of Rock Salt from Berchtesgaden, in South Germany—by an O.M.

A very valuable series of specimens of gold, &c.,—by F. Andrews, Esq., per J. F. Biden, Esq.

Maundy Money, 1874—by R. S. Mansel, Esq.

Transactions and Proceedings of the New Zealand Institute, Vol. 7th,—by the Institute.

Catalogue of Coins in the collection of Major Creeke—by the Author.

"Turf Carvings" by J. Stevens, Esq., M.R.C.P.—by the Author.

Gray's Handbook of Birds, 3 vols.—by Right Hon. Sir David Dundas.

Science Gossip—by Rev. J. M. Fuller.

The collection of Gold Ore, &c., presented by F. Andrews, Esq., deserves more special enumeration.

Gold Ore, very rich (14¼ oz. of gold to ton of Ore); 2 specimens.

„ Wantanga Mine.

Quartz and Gold—Colorado.

Gold, Silver, &c.—Gilpin County, Colorado.

Silver and Galena—George Town.

Galena from Utah and Granger mine.

Galena showing large cubes.

Brittle and Ruby Silver—(two specimens).

Tellurium from Scott Mine, Cold Spring Mine, and Forest Mine, Colorado.

Telluride from Sugar-loaf District, Colorado.

Petzite from Forest Mine.

Native Copper from Colorado.

Carbonate of Lead from Redwing Mine, Utah, besides specimens of the surface Rocks, &c., from the District of Utah, &c.

ACCOUNTS.

JANUARY, 1875.

RECEIPTS.	£	s.	d.	EXPENDITURE.	£	s.	d.
Balance in hand	5	9	11	Subscription to Wilts Society	0	10	6
Sale of "Antiquities" ...	2	11	0	Velvin	7	1	9
Sale of Reports	54	17	6	Cane	1	4	11
Subscriptions (Hon. Members)	1	7	6	Dale	3	13	0
Ditto Members	3	0	0	Carpenters	0	10	0
C. W. Bourne, Esq., Composition	2	2	0	Gas Globes in Museum ...	0	4	0
					£13	4	2
				Balance in hand	56	3	9
	£69	7	11		£69	7	11

MAY, 1875.

	£	s.	d.		£	s.	d.
Balance in hand	56	3	9	Velvin	1	18	0
Arrears (Hon. Members)	0	17	6	Duck (1st Field-Day) ...	6	0	0
Ditto (Members)	1	16	0	Duck (2nd ditto)	3	13	6
Sale of Reports	28	12	0	Perkins (Printing Reports)	43	3	0
Members' Subscriptions ...	4	18	0	Perkins (ditto ditto) ...	22	3	6
Donation	0	5	0				
Rev. G. W. De Lisle, Subscription and Field-Day	0	9	0		£76	18	0
Field-Day (1 Member) ...	0	3	0	Balance in hand	16	6	3
	£93	4	3		£93	4	3

SEPTEMBER, 1875.

	£	s.	d.		£	s.	d.
Balance in hand	16	6	3	Burgess	2	0	8
Rev. F. W. Farrar, D.D.	1	1	0	Cane	3	15	0
Rev. J. S. Thomas	1	1	0	Labels for Fungi	0	1	0
Subscriptions and Arrears (Hon. Members)	2	10	0	Carpenters	0	6	0
				Papers and Binding Books	2	15	0
Subscriptions (Members)	3	4	0	Gardener	1	19	0
Field-Day Arrears	0	12	0				
J. B. Fuller (Composition)	2	2	0		£10	16	8
One Report	0	2	6	Balance in hand	16	5	10
Sale of Maps	0	3	0				
Fines	0	0	9				
	£27	2	6		£27	2	6

GROUSE.

The physical characteristics of the genus *Tetraonids* are as follows:—The bill is strong and short, the upper mandible being convex, and arched from the base to the tip: The nostrils are basal and lateral, partly closed by an arched scaly covering, and entirely hidden from view by a growth of closely-set small feathers. The skin immediately above the eye is naked, and red with papillae, the bright or dull colour of this skin being a sure test of the health of the bird, that of the healthy bird being a brilliant scarlet, while in diseased birds the scarlet fades to a dull reddish brown. The wings are short and rounded, the fifth quill-feather being the longest; the tail consists of sixteen feathers. The toes are naked; there are three in front united as far as the first joint, and one small one behind.

First and foremost of the four kinds of grouse comes the largest and rarest, the capercailie. Its name, the Gaelic *Capullcoille*, as well as the Latin *urogallus*, refers to its large size. It is rarely met with in Scotland, its general home being the pine-woods and moors of Norway, principally in the northern districts. It does not, however, remain on the open hills when snow is on the ground, but like the rest of the genus tetraonidae, makes downwards for the shelter and food afforded by the forests and low-lying valleys. Its food is the shoots and young leaves of the Scotch fir, which it is said to prefer to the spruce, though what difference exists between the two as articles of food is hard to see. Juniper, cranberries, and blueberries, with the insects found on them, also furnish it with food. In the spring, often even before the snow is nearly gone, the cocks make the woods resound with their calls to the hens. It is hard to describe this extraordinary manœuvre; imagine a large bird seated on a branch or on the trunk of a fallen tree, with his head thrown back, his eyes closed, and his beak widely distended, and his feathers ruffled like those of an excessively irate turkey-cock. In this position, for several minutes, he emits a hideous and startling medley of sounds, crowing, singing, and clucking, all mixed together. They usually keep near certain spots during the season in which they do this, and often fight furiously among themselves. The females make a rough nest on the ground, and the young are from six to twelve in number; these stay with the mother till autumn,

the cock deserting the hen during her incubation, and remaining hidden among the bushes and rocks during the time of changing their plumage.

Except when the ground is covered with snow, the Capercailie remains on the ground during the day time, grouse being from the nature of their feet rather walkers than perchers—but roosts on trees; in very cold weather like other grouse, they frequently bury themselves in the snow. Their flight is often long and lofty, and is very quiet considering the large size of the bird: the weight varies from ten pounds to fifteen, in the cocks, the hens being considerably smaller.

The Capercailie is easily domesticated, and there are stories of its even breeding in confinement, the cocks, however, often become very savage, and will attack all intruders very fiercely. Hybrids of the Capercailie and the black grouse, generally males, have frequently been met with: of their plumage, as well as of the plumage of all the kinds of grouse, Yarrell gives a very good account.

Next in natural features to the Capercailie comes the Black Grouse. I will speak of this species and not of the Ptarmaigan, here, because though the Black Grouse is far the more common in Great Britain, it resembles the Capercailie in being gregarious and in being more of a tree-inhabiting bird than the other two varieties of grouse. Like the Capercailie, the Blackcock summons the hens to him in the spring by "beeking," though not so elaborately and furiously as the larger bird: they soon desert the hen when incubation begins, though about fifteen years ago a brood of young black game was observed near Whitfield, in Northumberland, towards the end of August, nearly twenty in number, accompanied not only by the hen but also by the old cock: this however is quite a solitary instance, and even here the presence of the cock with the young brood may have been accidental and only temporary. The old cocks congregate in little bands of six or seven, and fight furiously; upwards of fifty, however, were lately observed together in the spring, in the North of England; their flight is very long and often lofty; in the spring especially they travel great distances, and even young birds less than a year old will fly three or four miles when disturbed. The old cocks are exceedingly wary and consequently hard to approach; the younger birds on the other hand are exceedingly tame, and will lie so close that early in the season it is almost barbarous to shoot them; it would, indeed, be better if the commencement of the season for black game was fixed a fortnight later, as the young birds are rapidly acquiring more mature wits as well as more complete plumage and larger bodies, about the end of August.

The black grouse live principally on low ground at the edge of the moors, eating grass seeds, heather shoots, and the young sprays of Scotch fir; they not unfrequently visit corn fields; thus they are often brought into contact

with pheasants, and hybrids of the pheasant and black grouse (and even of black grouse and barn-door fowls), have been frequently met with.

The Red Grouse differs in several characteristics from the above species of grouse, notably in having the toes completely feathered with small light grey feathers, which are well adapted for protecting its feet in cold weather, since unlike the black grouse and Capercaillie, it never perches on trees; it often buries itself in the snow, and instances have been met with of birds being thus starved, a crust forming on the surface while they are below in a sort of torpor, through which they are subsequently unable to penetrate to the surface again. The snow is also their enemy in another way, for unprincipled sportsmen clothe themselves in white and are thus enabled to approach the birds much nearer than they would otherwise be able to do, in the wild state of the grouse in winter. In severe weather they leave the higher ground for the rough fields and broken ground at the edge of the moors, to a great extent, to obtain shelter and greater warmth than is possible on the bleak exposed parts of the higher moors: however their feathers, which are of great thickness, are an ample provision against almost any amount of cold, and will even stop shot from penetrating at a long range, in the latter part of the year, when they are in their full winter plumage and their feathers are hardened by the weather. Their flight is very rapid, and they generally turn with the wind, when disturbed, and depart to leeward with considerable activity. On the Northumberland moors a considerable number of birds move up into the higher ground when they pair in early spring, and move downwards when the young are grown, making still nearer the grass lands as winter comes on. The female sits very close on her nest; the fewer hen birds to be seen on a moor in the breeding season the better, for they will not rise till almost lifted, so that without a dog scarcely half-a-dozen nests could be found in the day. English grouse arrive at full growth earlier than 'Scotch, the young birds shot at the beginning of the season are larger. The red grouse is readily tamed, breeds in confinement, and may even be taught to perform tricks; a story of one which could speak is, however, hardly credible.

The Ptarmigan, the smallest grouse, is only found in Scotland, though in former days it existed further South. It still remains in the wildest parts of northern Scotland, living on berries, seeds, and tender shoots; it is easily approached, probably from being rarely disturbed. They, like the red grouse, assemble in large packs of fifty or more in winter, but the broods remain united later in the year than is the case with other species. The Ptarmigan is remarkable for changing its plumage to nearly white in winter, being in summer of a mottled brown: the red grouse often has the tips of the feathers on its breast white, so as to make it almost entirely white-breasted, but this is

partly caused by age, and is not universal; it is also generally confined to cocks.

The mysterious disease which has lately decimated the grouse has been the source of much speculation, but it is the opinion of a practical experienced authority that it is caused by internal parasites resulting from the fact that the grouse are obliged to eat old dry musty heather-shoots instead of young and tender ones. This is caused by two things; firstly, the heavy stocking of the moors with sheep and horned cattle, and the progress of draining, makes the heather poor and weak as well as dirty and trampled, while when heather is burnt off to renew it, the sheep eat it before the grouse can get at it—as the sheep like it better than grass, and the grouse will not come to it while sheep are there—and before it can grow strong and healthy. Secondly, the selfishness of many owners of moors causes them not to shoot over their moors for several seasons, to ensure heavy sport when they do go to shoot, and in consequence the overcrowding of the grouse helps the causes above mentioned, so that the disease seems likely to become periodical. It is certain that the reclaiming of mountain and moor land, which is being successfully carried on, and the consequent gradual decline of the grouse, will add vastly to the resources of the country, yet we cannot but regret that the time must come some day when the 12th of August will be a day no greater than any other in the calendar.

THE following TABLES of WEIGHTS and MEASURES are supplementary to those given in the Report for Midsummer, 1874:—

BOYS ADMITTED SEPTEMBER, 1874.

No.	Name.	Form.	House.	Born.	Height. ft. in.	Weight. st. lbs.	Circumference of Head. in.	Chest. in.	Arm. in.	Leg. in.	Place of birth.
533	Alexander, F.H.T.	Mid. 4 (b)	W.E.M.	Nov. 60	5 2½	7 5½	22	29	8½	11½	Boulogne.
488	Bailey, E.B.	Low. 2	W.F.	Oct. 61	4 10½	6 8½	21½	27½	7½	11½	Hampshire.
545	Baillie, A.C.	Up. 3	F.E.T.	Mar. 61	4 8½	5 7½	21½	28	7½	10½	Brazil.
68	Baines, A.W.P.	Low. 2	H.R.	June 63	4 4½	4 10	20½	26	7½	10	London.
130	Benham, W.B.S.	Low. 4	C.W.B.	Mar. 60	4 10½	6 4½	20½	27½	8	11½	Middlesex.
381	Blackburne, E.A.W.	Mod. Mid. 1	Home-B.	Aug. 60	5 1	7 2½	21½	29½	8½	12	Dublin.
14	Bryant, F.J.	Low. 3	H.R.	Oct. 62	4 6½	5 2	20½	28	7½	10½	Devon.
386	Burne-Jones, P.	Up. 3	Home-B.	Oct. 61	4 8	5 11½	21½	27	7½	11½	London.
326	Callendar, H.L.	Low. 4	W.E.M.	April 63	4 9½	5 9½	21½	26½	7½	10½	Gloucestershire.
530	Cairnes, J.J.	Mod. Up. 2	W.E.M.	Sept. 60	5 3½	8 2½	22	32½	8½	12½	Dublin.
452	Charteris, A.D.	Mod. Mid. 2	J.B.G.	Mar. 60	5 3	7 12½	21½	29½	9½	12½	London.
535	Cotterill, H.G.	Mod. Mid. 1	W.E.M.	Nov. 60	5 0½	7 0½	22	28½	8½	12½	London.
35	Cox, E.M.R.	Low. Sh.	H.R.	Jan. 62	5 0½	7 0½	21½	29½	8½	12	Derby.
445	Creeke, A.B.	Mid. 4 (a)	T.A.P.	Sept. 60	5 4½	6 8½	22½	27	8½	11	Lancashire.
161	Davidson, J.R.B.	Low. 5 (2)	E.W.M.L.	Jan. 60	5 0½	7 1½	21½	29	8	12	Agra.
334	Davies, E.H.M.J.	Mid. 4 (a)	Home-B.	May 61	5 3	8 3½	21½	30½	9	12½	Boulogne.
283	Drake, A.T.	Up. 2	H.R.	Oct. 61	5 10½	6 8½	21	29	8½	12	Essex.
98	Fernandez, H.E.	Low. 5 (2)	H.A.J.	Jan. 61	5 2½	7 11	22	30	9	13	Cornwall.
125	Finch, J.	Mid. 4 (a)	Home-B.	April 60	5 1½	7 5½	21½	31½	8½	12	Surrey.
111	Firth, H.R.	Low. 3	H.R.	Feb. 64	4 6	5 11½	21	27½	8	11½	Lancashire.

No.	Name.	Form.	House.	Born.	Height. ft.	Height. in.	Weight. st.	Weight. lbs.	Circumference of head. in.	Circumference of chest. in.	Circumference of arm. in.	Circumference of leg. in.	Place of Birth.
369	Foord, J.	Up. 3	H.R.	Jan. 61	5	3½	8	6	22⅞	31¾	9	12¾	Yorkshire.
370	Foord, B.	Low. 2	H.R.	March 63	4	6	5	1¼	20½	26½	7½	10¼	Yorkshire.
553	Gaze, W.J.R.	Up. 4 (a)	F.E.T.	May 59	5	3¼	8	1	21¾	31¼	9	12½	Isle of Wight.
7	Gilbanks, G.E.	Up. 3	H.R.	Oct. 60	4	11½	7	2¼	21½	28¼	8¼	12	Worcestershire.
71	Glyn A.P.	Low. 2	H.R.	May 64	4	9½	5	12½	21½	26¾	7½	11½	Durham.
354	Godley, J.C.	Up. 4 (a)	T.A.P.	Feb. 61	4	11	5	4¼	21½	28	7½	11¼	Cavan.
503	Gostenhofer, G.	Low. 4	W.E.M.	Dec. 59	5	2½	6	11¼	20½	30	8	11½	New Orleans.
348	Grove, J.C.	Mod. Mid. 1	F.E.T.	April 59	5	1¾	6	13¾	21¼	27	7¾	12	Kent.
272	Hankey, A.J.A.	Up. 3	H.R.	Oct. 60	5	2⅜	7	2¼	21	29¼	8½	12½	Cheshire.
571	Hatch, A.V.	Mid. 4 (b)	F.E.T.	Sept. 60	5	2¾	7		21	30	8	11½	Simla.
28	Hawkins, G.G.	Up. 4 (b)	A.H.B.	Aug. 60	5	0¼	6	9½	21½	29½	8½	11	Sussex.
455	Hordern, H.R.	Up. 2	W.F.	Nov. 62	4	7½	5	5	21¾	27	7½	11	Kent.
216	Jones, C.W.B.	Low. 4	C.W.B.	Dec. 60	4	9¾	6	9¼	21½	28¾	8¾	12¾	Warwickshire.
245	Kerry, A.P.	Low. 2	H.R.	June 62	4	7½	5	6½	20½	27½	7½	11	London.
527	Law, F.H.A.	Low. 4	W.E.M.	June 60	4	11⅝	6	8	21⅝	28½	8	11⅝	Somersetshire.
429	Lawrie, H.L.	Up. 3	W.E.M.	March 64	4	7½	4	12	21	26	6½	10	Kent.
88	Lawson, F.B.	Low. (5) 2	H.A.J.	July 61	5	1¾	7	12¾	20¾	30	8½	12¾	Wilts.
253	Peake, E.	Low. 5 (2)	H.A.J.	March 60	5	5½	7	9	22	30¾	9	13	Gloucestershire.
478	Petrie, G.D.	Mod. Mid. 1	W.F.	April 60	5	0¾	6	12¼	21	29¼	7¾	11¾	Peru.
482	Petrie, R.D.	Mod. Mid. 1	W.F.	Sept. 61	4	8	5	8¾	21	27	7½	11½	Peru.
244	Reeves, E.J.	Up. 3.	C.W.T.	Sept. 60	4	9½	5	4¾	20¼	26¼	7¼	10	Hampshire.
490	Robertson, G.T.	Low. Sh.	J.B.G.	Nov. 62	4	6¾	5	10¼	21½	27½	7¾	11½	India.
149	Rogers, G.R.	Low. 3	H.R.	March 61	4	4	4	11	20½	26	7	10½	India.
150	Rogers, M.	Up. 3	H.R.	Sept. 62	4	6½	5	6½	21½	26½	7½	10¾	London.

No.	Name.	Form.	House.	Born.	Height. ft.	Weight. st. lbs.	Circumference of head. in.	chest. in.	arm. in.	leg. in.	Place of birth.
275	Sanders, H.M.	Up. 2	H.R.	Oct. 61	4 9	6 8½	21½	26½	8	12	Devon.
240	Sankey, E.T.	Low. Sh.	H.R.	Dec. 61	4 7	5 8½	20½	25½	7	11	Kent.
341	Tanner, M.	Low. 2	H.R.	Sept. 64	4 5½	5 9	22	28	7½	11	Wilts.
*504	Tothill, F.W.G.	Low. 5 (2)	W.E.M.	May 60	4 9½	5 12½	20½	27	7	11	Somersetshire.
178	Trevenen, W.T.	Mod. Mid. 2	E.W.M.L.	Dec. 59	5 6½	9 6	22	31	9	13½	Huntingdonshire.
51	Turner, A.B.	Up. 3	H.R.	Aug. 62	5 1½	7 4½	22	31	8½	12½	Wilts.
134	Wanklyn, F.L.	Mod. Mid. 1	A.B.	Feb. 60	5 4½	7 10	22½	30½	8½	12	South America.
251	Webb, C.W.H.	Low. 4	A.B.	Sept. 60	5 2½	7 3½	21	28	7½	11½	Wilts.
103	Wheeller, A.	Low. 5 (2)	A.H.B.	June 60	4 8½	5 13	21½	28½	7½	12	Surrey.
74	Wilson, C.M.	Low. 4.	A.H.B.	Oct. 61	4 7½	6 0½	21½	28½	8	11½	Sheffield.
492	Windeler, C.B.	Mod. Mid. 1	J.B.G.	Nov. 59	4 10½	6 9½	21	29	7½	11½	London.
				BOYS ADMITTED JANUARY, 1875.							
241	Acton, A.H.	Up. 3	F.E.T.	Mar. 61	5 2½	8 6½	22½	30½	8½	13	London.
274	Alston, J.H.	Low. 4	A.B.	Dec. 61	4 11½	7 2½	21	29½	8½	12½	Lanarkshire.
507	Barrett, A.V.	Low 2	W.E.M.	July 62	4 10½	5 8½	21½	26½	7½	11	London.
387	Bowlby, C.W.	Up. 3	T.A.P.	May 61	4 10½	6 5	21½	28	7½	11½	Northants.
303	Coghlan, E.W.	Mid. 4 (a)	C.S.	May 62	4 9	6 11½	21	28½	8	12	Middlesex.
431	Cole, F.E.	Low. Sh.	W.F.	July 62	4 5½	5 5	20½	26	7½	11	Middlesex.
324	Currie, C.E.	Low. 4	A.H.B.	April 61	4 9	6 0½	20½	28	8½	11½	Berks.
197	Davis, A.H,	Up. 2	H.R.	Oct. 62	4 8½	4 7½	20	26½	6½	10	Surrey.
485	Dickenson, H.	Mod. Low.	J.B.G.	Aug. 59	5 5½	7 11	21	28	7½	12	Shropshire.
200	Ducat, C.M.	Mod. Up. (2)	A.H.B.	Sept. 60	4 7½	5 9	20½	27	7½	10½	Bombay.

* Was Weighed and Measured November, 1875.

No.	Name.	Form.	House.	Born.	Height. ft. in.	Weight. st. lbs.	Circumference of head. in.	chest. in.	arm. in.	leg. in.	Place of birth.
201	Ducat, W.A.	Mod. Low.	H.R.	Nov. 61	4 7½	5 5½	20¾	28	7¼	10	Bombay.
422	Duncan, F.	Up. 3	T.A.P.	Dec. 62	4 7¾	5 9½	21	27½	7½	10¾	London.
286	Edgeworth, C.	Low. 4	A.H.B.	May 60	5 4	9 1¼	22½	31½	9¼	13	Longford.
78	Ellis, C.R.C.	Low. Sh.	H.R.	Mar. 63	4 7½	6 9¼	21	28	8¾	13	Berks.
389	Gibson, J.	Low. 2	T.A.P.	Aug. 63	4 5½	5 1½	21	26	6¾	10½	Norfolk.
390	Goddard, T.A.	Low. 4	W.F.	Sept. 61	4 8	5 8½	21¼	28	7½	11	Staffordshire.
57	Godfrey, W.R.	Low. 4	H.R.	April 62	4 9¾	6 2½	21	29	7¼	11½	Somersetshire.
207	Halcomb, F.T.	Low. 3	H.R.	June 62	4 8½	5 10½	21½	25½	7¾	11¼	Staffordshire.
418	Handley, A.A.	Up. 3	C.W.T.	Sept. 61	4 11	6 0½	20	27½	7¼	11½	Calcutta.
343	Hill, R.A.S.	Low. 4	Home-B.	Feb. 61	5 5	9 7½	21½	32½	9½	13¼	Somersetshire.
44	Hitchcock, C.	Up. 4 (b)	H.A.J.	Dec. 60	5 4¾	9 3½	21¼	33	10¼	13	Gloucestershire.
561	Hogg, C.J.H.	Up. 3	F.E.T.	July 61	4 9¾	6 1¾	21	27	8	11¼	India.
4	Hugh-Jones, E.B.	Up. 4 (a)	E.W.M.L.	Oct. 60	5 4½	8 1½	22¼	30	8½	12¾	Flintshire.
317	Laidlay, J.W.	Mod. Low.	A.H.B.	Sept. 60	5 1½	7 1	21¼	30½	7½	11¾	Sussex.
92	Lascelles, W.E.	Low. Sh.	H.R.	Mar. 62	4 10½	5 11	20¾	29	7½	11	India.
107	Lascelles, G.R.	Low. 2	H.R.	April 64	4 8¾	5 11¼	21	28	7¼	10½	India.
463	Lawford, H.B.	Up. 2	H.R.	April 64	4 6¾	5 5	21	26¼	7½	11	Surrey.
371	Lyde, L.W.	Low. 2	T.A.P.	Mar. 63	4 6¼	5 2½	21	26½	7¼	10¼	Cumberland.
487	Lynes, J.	Up. 2	Home-B.	Jan. 63	4 9	6 6	21½	28	8¼	11½	Bedfordshire.
162	Martineau, S.	Low. 2	H.R.	Jan. 63	4 7¾	5 11½	20¾	27¾	8¾	11	Surrey.
81	Maturin, B.A.	Mid. 4 (a)	E.W.M.L.	May 60	4 9¼	6 3½	21¼	27½	7¾	11½	Hampshire.
246	Nash, F.P.	Mid. 4 (a)	H.A.J.	June 61	5 4	7 8¼	21	29½	8¼	12½	Gloucestershire.
288	Nicholets, J.	Up. 2	H.R,	May 62	5 0½	7 6½	22	30	8½	12½	Somersetshire.
239	Orger, L.A.	Mid. 4 (b)	H.B.H.	Dec. 61	4 8½	5 12½	20¾	27¾	7½	11½	Northamptonshire.

No.	Name.	Form.	House.	Born.	Height. ft.	Height. in.	Weight. st.	Weight. lbs.	Circumference of head. in.	Circumference of chest. in.	Circumference of arm. in.	Circumference of leg. in.	Place of Birth.
340	Peel, E.L.	Mod. Mid. 1	H.R.	Jan. 60	5	0½	5	11½	20½	27½	7½	10½	London.
21	Phipps, C.O.	Mid. 4 (b)	E.W.M.L.	Mar. 61	5	1	6	12½	21½	29	8	11½	Middlesex.
421	Porter, A.L.	Low. 2	T.A.P.	Jan. 64	4	6½	5	3½	20½	26½	7	10½	Surrey.
379	Richards, W.M.	Up. 2	T.A.P.	Jan. 63	5	2½	7	0½	21½	30	7½	11½	Somersetshire.
144	Richardson, E.T.	Mid. 4 (a)	H.A.J.	Nov. 60	4	9½	6	6½	21½	28	8	12½	London.
133	Robinson, P.F.	Up. 3	H.R.	April 61	5	0½	6	10½	21½	28	7½	11½	Surrey.
554	Robinson, F.S.	Low. 3	F.E.T.	Sept. 62	4	7½	5	6½	21½	27	7½	11	London.
68	Saunders, A.N.	Up. 2	H.R.	July 63	4	4	4	7½	20½	25½	7	10	Monmouthshire.
143	Stanton, J.W.	Mid. 4 (a)	A.B.	July 60	5	2½	8	7½	22½	30½	9	13	Lincolnshire.
86	Swindells, A.W.	Mid. 4 (b)	H.A.J.	Oct. 60	4	11½	7	11½	22½	31	9½	13½	Cheshire.
123	Temple, G.E.	Mid. 4 (a)	E.W.M.L.	Aug. 60	5	11½	6	10	21½	28	7½	12	India.
573	Trotter, A.O.	Up. 3	F.E.T.	Feb. 61	4	8½	4	8	21	26½	6½	10	Gloucestershire.
10	Vane, H.G.B.	Mod. Low.	C.S.	July 61	4	11½	7	0	21½	27	8½	12½	Ceylon.
179	Wainwright, C.R.	Mod. M. (2)	Home-B.	Oct. 60	5	7	10	4½	21½	34½	10½	13½	Somersetshire.
461	Windeler, G.H.	Mod. Low.	J.B.G.	Aug. 61	5	1½	7	4	22½	27½	9	12½	London.
				BOYS ADMITTED MAY, 1875.									
258	Askwith, J.B.H.	Low. 4	H.A.J.	Aug. 62	4	9½	6	6½	22	28½	8½	11½	Essex.
167	Barlow, L.A.P.Pratt.	Mod. Low.	C.S.	June 60	5	3½	7	5½	20½	28	8½	12½	Berks.
169	Barlow, B.F.P.Pratt.	Low. 2	H.R.	Aug. 63	4	9½	5	11½	20½	26	7½	11½	Berks.
22	Baynes, H.R.	Low. 2	H.R.	June 62	4	4½	4	11½	21	25	7½	10½	Bucks.
188	Bent, B.H.	Up. 3	H.R.	July 61	4	9½	5	11	21½	26½	7½	11½	Yorkshire.
531	Booth, A.W.	Low. 4	W.E.M.	April 61	4	9½	5	9½	21	26	7½	10½	London.
52	Bullock, S.L.	Low. 2	H.R.	Aug. 64	4	6½	5	4	21½	26½	7	10	Middlesex.

No.	Name.	Form.	House.	Born.	Height. ft.	Height. in.	Weight. st.	Weight. lbs.	Circumference of head. in.	Circumference of chest. in.	Circumference of arm. in.	Circumference of leg. in.	Place of Birth.
476	Butler, G.W.	Mid. 4 (a)	J.B.G.	Aug. 61	4	6½	5	1	22½	27	6¼	10½	Suffolk.
498	Dawson, H.A.	Mid. 4 (a)	F.E.T.	Dec. 60	5	0½	6	5½	21½	29	8½	12	London.
342	Elgood, P.G.	Up. 2	T.A.P.	July 63	4	9½	6	7½	21½	28½	8½	11½	London.
399	Fanshawe, R.	Low. 2	W.F.	Mar. 64	4	7	5	5½	21½	26	7½	11½	Oxfordshire.
481	Fox, W.A.	Up. 3	J.B.G.	May 61	5	3	7	1½	21¼	29	8	12	Staffordshire.
507	Haigh, A.S.	Mod. Low.	W.E.M.	Feb. 61	5	0½	7	5½	21½	30½	8½	13	Yorkshire.
540	Hardwick, H.G.C.	Up. 2	W.E.M.	Sept. 62	4	11½	6	12	22½	28½	8½	12	Yorkshire.
*27	Hawkins, J.E.	Low.	H.R.	Nov. 63	4	7	5	7½	21½	26½	7½	10½	Hants.
439	Jordan, A.O.	Low. 4	Home-B.	April 61	4	8½	6	1	21½	27	7½	11	Pembrokeshire.
204	Kirkpatrick, G.A.	Low. 3	H.R.	Oct. 63	4	5	5	0½	21½	27	7	10	Westmeath.
427	Lemon, E.W.	Up. 4 (a)	Home B	Aug. 60	5	0½	6	1	21½	27½	7½	10½	Cornwall.
473	Mackenzie, A.F.	Low. 4	J.B.G.	April 61	5	2½	6	13½	22½	27½	7½	11½	Rossshire.
491	Millais, G.W.	Low. 2	F.E.T.	Sept. 63	4	7½	4	13	20	25	6½	10	London,
270	Nicholson, W.C.M.	Up. 2	H.R.	Oct. 63	4	8½	5	9	21½	27	7½	11½	Somersetshire.
396	Pinder, J.H.	Mid. 4 (b)	W.F.	Mar. 62	4	10	7	0½	21½	26½	7½	11½	Devon.
496	Sharp, B.C.	Up. 3	F.E.T.	Mar. 62	4	11½	7	5	21	29	8½	13	Surrey.
241	Smith, S.	Up. 2	H.R.	Oct. 62	5	7	6	2½	21½	28	7½	11½	Wilts.
487	Stewart, G.L.	Mid. 4 (b)	F.E.T.	Sept. 61	5	0	6	7	20½	27	7½	12	London.
124	Ward, E.	Low. Shell	H.R.	Nov. 63	4	7½	5	2½	20½	24½	7½	11	N.W.P. India.
172	Westcott, H.	Low. 4	H.R.	Feb. 61	4	7	5	9½	21	27½	7½	10½	Middlesex
180	Westcott, G.H.	Mid. 4 (a)	H.R.	April 62	4	4½	4	13½	21½	25	7½	10½	Middlesex.
218	Williams, A.W.A.	Up. 2	H.R.	Jan. 65	4	8	5	5½	21½	27	7½	10½	Monmouthshire.
236	Yeatman, C.	Mod Low.	E.W.M.L.	June 60	5	6½	7	10½	22	29½	8½	12	Lincolnshire.

* Was Weighed and Measured November, 1875.

No.	Name.	Form.	House.	Born.	Height. ft. in.	Weight. st. lbs.	Circumference of head. in.	chest. in.	arm. in.	leg. in.	Place of Birth.
336	Yorke, R.L.	Up. 2	C.W.T.	Nov. 62	5 0	5 12¾	20¾	27½	6¾	10¾	Herefordshire.
380	Youngs, J.J.	Up. 3.	T.A.P.	July 61	4 11	7 4	22	28	9	12½	Norfolk.
383	Youngs, L.	Low. 2	T.A.P.	Aug. 63	4 7¾	5 8¾	22	25½	7½	11	Norfolk.
				BOYS ADMITTED SEPTEMBER, 1875.							
105	Baker, S.R.	Low. 5(2)	C.S.	Oct. 61	5 0¾	6 9	21½	28	7¾	12	Worcestershire.
353	Baker, A.R.	Up.3	C.W.T.	Jan. 62	4 11¼	7 5½	21	30	9	12½	Somersetshire.
526	Barrett, A.E.	Mod. Low. (2)	W.E.M.	Feb. 61	5 2¼	7 4¼	21¼	28	8	12	London.
392	Beaumont, F.L.M.	Mod. Low. (2)	A.H.B.	June 62	5 1¼	7 10¼	22¼	28	9½	13	Leicestershire.
302	Bent, H.	Low. Shell	C.W.T.	Jan. 63	4 10½	6 7¾	21½	27	8	12¾	Yorkshire.
430	Besch, J.G.Q.	Low. 4	J.B.G.	June 61	5 6	9 10	21½	32	10	13¾	Middlesex.
362	Birch, J.S.	Up. 3	W.F.	Oct. 61	5 2½	7 5½	20	27	8¾	12	Liverpool.
409	Blair, G.	Mod. Low. (1)	J.B.G.	May 61	5 3¼	7 12½	21½	31	8¾	12½	Stirlingshire.
537	Booth, C.L.	Up. 4 (a).	W.E.M.	June 62	5 0½	6 8½	20¾	29½	8½	11	London.
215	Bowlby R.R.	2nd Form	H.R.	Aug. 63	4 11	6 8½	21½	28	8	11½	Northants.
417	Braddyll, H.E.	Up. 3	J.B.G.	Nov. 63	4 10¼	5 8	20¾	25¼	7	10¾	Cheshire.
318	Browning, C.S.	Mid. 4 (a)	C.W.T.	Sep. 62	4 10¼	6 10¼	21	28½	8¼	11¾	India.
46	Cargill, H. S.	Low. 4	H.B.H.	Oct. 60	5 3	7 2	21¾	28¾	7¾	11¼	Perthshire.
400	Carnegie, H.J.F.	Low. 4	J.B.G.	Dec. 61	4 7¾	5 4¾	21½	27	7½	11	India.
572	Carr, W.	Mid. 4 (a)	F.E.T.	Jan. 62	4 9	5 10½	22	26¾	8	10½	Yorkshire.
61	Coombe W.E.	2nd Form	H.R.	Oct. 64	4 8½	5 7½	21½	26½	7¼	10½	Sussex.
420	Cooper, H.J.	2nd Form	Home B.	Jan. 64	4 9½	6 3¼	21½	27¾	7¾	11	Somersetshire.
63	Crawley, G. H.	2nd Form	H.R.	Nov. 63	4 9¼	5 6½	21¼	25¾	7	11	Essex.
164	Daltry, V.E.	Mid. 4 (a)	H.R.	Oct. 61	4 9¾	6 9¼	21¼	28	7¾	12	Staffordshire.

No.	Name.	Form.	House.	Born.	Height. ft.	Height. in.	Weight. st.	Weight. lbs.	Circumference of head. in.	Circumference of chest. in.	Circumference of arm. in.	Circumference of leg. in.	Place of Birth.
339	Dickenson, A.E.	Up. 3	W.F.	Nov. 63	4	9½	5	10½	21¼	26¼	7½	10¼	Shropshire.
378	Eden, R.H.H.	Low. Shell	A.H.B.	Dec. 63	4	6	5	3	20¾	25	7	10¾	Nottinghamshire.
502	Elder, H.M.	Up. 4 (b)	W.E.M.	Mar. 61	5	5½	10	3	22¼	33	11	14	London.
337	Fowler, G.H.	Low. 5 (1)	T.A.P.	Sep. 61	5	2½	7	8½	21	28½	8½	12¾	Lincoln.
371	Fox, R.F.	2nd Form	W.F.	Aug. 64	4	7½	5	4	21	26	7	11	London.
135	Garden, H.M.	Low. Shell	H.R.	July 63	5	0	7	0½	21	29½	8¾	12½	India.
152	Gunner, E.J.	Up. Shell	E.W.M.L.	Jan. 62	5	2½	7	6	21½	28½	8½	12½	Hampshire.
34	Hammond J.J.	Low. Shell	H.R.	June 63	4	11	6	7½	21½	26¾	8	12	Wilts.
38	Heaton, E.	Up. Shell	W.M.F.	Aug. 61	5	8	8	10½	22¼	30¼	8¾	12½	Denbighshire
194	Hume, G.P.V.	Mod. M. (2)	W.M.F.	July 61	5	2½	8	8¾	21¾	31	8¾	13½	Devon.
221	Jordan, E.	Up. 3	H.R.	Dec. 62	4	10½	6	0	20¾	27¼	7½	10¾	Oude.
304	Kesteven, T.L.	Low. 3	C.W.T.	Feb. 63	4	11¾	6	2½	21½	26¾	7½	11	Warwickshire.
84	Kitcat, H.D.P.	Low. 5 (2)	W.M.F.	June 61	5	2	7	13½	21¾	30½	9¾	13¼	Gloucestershire.
586	Laughlin, C.E.	Mod. Low. (2)	J.B.G.	Feb. 61	5	4½	7	12¾	21¼	29	8¾	12	Northants.
506	Law, C.W.A.	Mid. 4 (a)	W.E.M.	Nov. 61	5	1¼	7	4¾	21¼	31½	8½	12	Somersetshire.
146	Leach, H.	Up. 3	H.R.	Mar. 62	4	11¾	6	11½	21¾	27½	8¼	12¼	Yorkshire.
576	Leverton, E.S.	Up. 4 (a)	W.E.M.	Sep. 59	5	4½	8	6¾	22¼	30	8¾	12½	Cornwall.
536	Lowder, E.G.	Low. 4	W.E.M.	Sep. 62	4	9½	5	6¾	21½	25½	7½	11	Japan.
282	McGildowney, T.E.	Low. 4	J.B.G.	April 61	4	10½	6	9¼	21	28¼	7½	11½	Antrim.
544	Morris, A.S.	Up. 4 (b)	F.E.T.	Nov. 61	4	5¼	6	10¼	22	26¾	7¼	11½	Kent.
127	Morton, W.R.	Mod, Mid. (2)	E.W.M.L.	July 61	5	0	6	10	21½	27¼	8	11¾	India.
259	Mullins, E.P.	2nd Form	H.R.	Mar. 63	4	4½	5	5½	21	26½	7½	11	Surrey.
222	Nott, H.J.	2nd Form	H.R.	Dec. 63	4	7½	6	2¼	21½	28	7¾	11½	Liverpool.
389	Peel, A.R.	Up. 3	A.H.B.	Jan. 62	4	10¼	5	10¾	21	26¾	7½	11	London.

No.	Name.	Form.	House.	Born.	Height. ft.	Height. in.	Weight. st.	Weight. lbs.	Circumference of head. in.	Circumference of chest. in.	Circumference of arm. in.	Circumference of leg. in.	Place of Birth.
350	Pemberton, W.A.	Up. 3.	W.F.	Mar. 62	4	8	6	1	20½	27	8½	11½	London.
235	Pigott, A.C.D.	Mod. Low. (1)	H.R.	Jan. 62	4	11	6	8	21½	27½	8	11½	Kent.
332	Preston, F.M.	Mid. 4 (b)	TA.P.	Mar. 61	5	3	6	8½	21	28½	7½	10½	Flintshire.
228	Price, T.G.L.B.	Mid. 4 (b)	T.O.H.	Oct. 61	5	1½	7	11½	21	30½	8½	12½	Down.
338	Richardson, L.J.	Up. 3	T.A.P.	Mar. 62	5	3½	7	9½	21½	28½	8½	12	Glamorganshire.
441	Roper, A.W.	Mod. Mid. (2)	F.E.T.	July 62	4	9½	5	9	20½	27½	7	11	London.
319	Robertson, A.C.	Lower Shell.	H.R.	Mar. 63	5	1½	6	9½	21	27½	7½	11	London.
440	Rose, F.J.	Mod. Low. (2)	F.E.T.	Nov. 60	4	11½	7	0	22½	30	8	11½	Hampshire.
278	Smith, B.T.	Mod. Low. (2)	W.E.M.	Jan. 61	5	4½	8	5	21½	30½	8½	12½	Herts.
110	Stawell, C.L.	Mid. 4 (a)	T.O.H.	Sep. 61	4	10½	6	11½	21½	28½	8½	12	Australia.
384	Stutter, F.W.	Low, 3	A.H.B.	Dec. 62	4	11½	6	6½	21½	27	8½	12½	Kent.
242	Swann, S.	Lower Shell	H.R.	Sep. 62	5	3½	8	4½	22	30½	9½	12½	Dorset.
42	Taylor, W.B.	Upper Shell	G.S.	Aug. 61	5	8	9	1½	21½	30½	9	13	Surrey
48	Thirlwall, W.B.	2nd Form	H.R.	Sep. 63	4	9½	6	2½	21½	26½	7½	11	Radnorshire.
556	Thompson, R.B.	Mid. 4 (a)	F.E.T.	Aug. 62	4	10½	6	7½	21½	28½	8	11½	London.
434	Vans-Agnew F.	Mod. Low. (1)	J.B.G.	Sep. 62	5	0½	6	2½	21½	27½	8	11½	Madras.
99	Walsh, B.J.M.	2nd Form	H.R.	Aug. 63	4	8	5	5	22	25	7	10½	Surrey.
145	Waugh, J.H.	Upper 4 (a)	E.W.M.L.	Feb. 61	5	7½	10	0½	21½	32	9	14	Cape Town.
266	Wilkinson, L.	Low 4	H.R.	July 62	4	7	5	7½	21½	26½	7½	11	Essex.
543	Williams, L.L.B.	Mod. Low. (1)	W.E.M.	Oct. 62	4	9½	5	13½	21½	28½	7½	11	Merioneth.
551	Wright, A.L.	Upper 3	F.E.T.	Feb. 62	5	1½	6	8½	21½	27	7½	11	Derbyshire.
552	Wright, H.F.	Low. 3	F.E.T.	Feb. 64	4	6½	5	1½	21	27	7½	10½	Derbyshire.
203	Yeatman, A.W.	Mid. 4 (a)	G.S.	May. 62	4	9½	5	10½	20½	26½	7	10½	Surrey.

TABLES.

Averages at Different Ages.

BOYS ADMITTED SEPTEMBER, 1874.

Average age at admission 13·26 years.

Number at each age.	*Age last Birth-day.*	*Height.*		*Weight.*		*head.*	*Circumference of chest.*	*arm.*	*leg.*
		ft.	*in.*	*st.*	*lbs.*	*inches.*	*inches.*	*inches.*	*inches.*
4	10	4	7·5	5	10·50	21·37	27·	7·44	10·68
5	11	4	7·4	5	8·4	21·2	26·6	7·5	10·9
7	12	4	9·7	6	4·	21·2	28.	7·7	11·3
15	13	5	0·2	7		21·5	28·6	8·80	11.88
22	14	5	1·2	7	3·1	21·34	29·2	8·20	11·90
2	15	5	3·	7	7·	21·5	29·1	8·36	11·25

BOYS ADMITTED JANUARY, 1875.

Average age at admission 13·07 years.

Number at each age.	*Age last Birth-day.*	*Height.*		*Weight.*		*head.*	*Circumference of chest.*	*arm.*	*leg.*
		ft.	*in.*	*st.*	*lbs.*	*inches.*	*inches.*	*inches.*	*inches.*
2	10	4	8·	5	11·5	21·	27·1	7·37	10·75
5	11	4	6·6	5	8·4	20·75	26·5	7·55	10·84
13	12	4	10·	6	2·	21·	27·7	7·71	11·2
16	13	5		6	11·8	21·22	28·1	8·1	11·8
11	14	5	2·6	8		21·6	29·1	8·6	12·4
2	15	5	3·5	7		20·6	27·75	8·	11·25

BOYS ADMITTED MAY, 1875.

Average age at admission 12·73 years.

Number at each age.	*Age last Birth-day.*	*Height.* ft.	in.	*Weight.* st.	lbs.	*head.* inches.	*Circumference of chest.* inches.	*arm.* inches.	*leg.* inches.
2	10	4	5·5	5	7·	21·5	26·75	7·37	10·25
9	11	4	8·	5	11·	21·1	26·5	7·5	11·
5	12	4	11·6	6	1·	21·5	27·5	7·7	11·2
8	13	4	10·4	6	11·25	21.5	27·25	7·7	11·6
9	14	5		6	11·	21·5	28·	8·	11·6

BOYS ADMITTED SEPTEMBER, 1875.

Number at each age.	*Age last Birth-day.*	*Height.* ft.	in.	*Weight.* st.	lbs.	*head.* inches.	*Circumference of chest.* inches.	*arm.* inches.	*le* inches
1	10	4	8·5	5	7·5	21·5	26·5	7·25	10·5
7	11	4	8·57	5	12·	21·1	26·55	7·5	10·8
14	12	4	11·	6	8·	21·1	27·5	7·9	11·5
25	13	5		6	10.6	21·3	27·7	8·	11·6
18	14	5	3·	8	2·	21·7	29·9	8·5	12·4
1	15	5	4·5	8	6·75	22·25	30·	8·75	12·5

FEBRUARY, 1873.

Days of Month.	Mean Readg. of Baromtr. reduced to 32°	Temperature. In the Shade. Highest.	Temperature. In the Shade. Lowest.	Temperature. In the Shade. Mean.	Highst insun's rays.	Lowst. on the grass.	Direction of the Wind. A.M.	Direction of the Wind. P.M.	Mean amt. of Cloud (0—10)	Rain.
	in	°	°	°	°	°				in.
1	29·548	31·3	28·0	29·5	39·1	28·0	S.E.	E.	10·0	0·08
2	28·873	30·7	23·3	27·1	31·7	23·3	E.S.E.	E.	10·0	
3	29·280	34·6	26·2	29·9	47·7	26·2	E.N.E.	N.	5·0	0·02
4	·567	36·0	28·4	32·4	40·4	26·3	N.	N.	10·0	0·05
5	·639	37·2	33·1	34·6	42·2	32·2	E.	N.E.	10·0	
6	·591	35·8	31·5	32·9	38·8	31·5	N.	N.E.	10·0	
7	·663	38·4	31·9	34·9	(71·5)	30·0	E.	E.	10·0	
8	·695	35·6	33·0	34·0	37·3	32·3	E.	E.	10·0	
9	·749	36·6	31·5	33·1	45·5	30·6	E.	E.	10·0	0·05
10	·798	41·8	30·2	35·1	57·1	28·6	E.N.E.	E.	9·0	0·02
11	·936	38·2	28·7	32·2	77·4	27·0	N.	N.	3·5	
12	·665	42·0	29.3	35·4	76·3	27·9	N.N.E.	N.N.E.	9·5	
13	·746	44·2	31·2	36 6	91·3	26·0	N.E.	N.N.W	0·5	
14	·824	44·0	32·2	38·1	52·7	29·2	N.N.W	N.	10·0	
15	29·982	42·6	36·6	39·1	48·5	34·0	N.	N.	10·0	
16	30·136	38·1	36·3	36·9	45·1	34·9	N.	N.	10·0	
17	·220	33·9	31·5	32·6	44·3	31·5	N.	N.	10·0	
18	·273	36·4	30·3	33·1	47·3	30·3	S.	S.E.	10·0	
19	·226	33·3	30·1	31·3	46·6	30·0	N.W.	E.S.E.	10·0	
20	30·089	38·1	28·8	32·9	46·6	28·7	E.	E.	10·0	
21	29·828	35·4	27·2	29·2	37·5	27·1	E.S.E.	W.	10·0	
22	·431	44·8	27·0	35·8	88·0	25·5	W.	W.	9·0	0·20
23	·360	42·3	30·2	34·8	84·3	28·6	S.E.	S.W.	9·5	0·45
24	·314	34·6	25·2	27·3	38·8	25·1	E.	E.	10·0	0·15
25	29·086	45·6	22·9	33·9	55·3	22·8	S.E.	S.W.	10·0	0·15
26	28·434	48·5	40·0	44·0	79·0	38·0	W.S.W	W.	10·0	0·05
27	28·950	42·6	37·6	39·1	79·0	37·6	N.	N.W.	9·7	0·15
28	29·303	38·7	28·0	32·5	95·6	22·3	W.	N.	6·5	0·16
Means.	29·614	38·6	30·4	33·9	55·9	29·1	...	...	9·0	Sum 1·53

MARCH, 1873.

Days of Month	Mean Readg. of Baromtr. reduced to 32°	Temperature. In the Shade. Highest	Lowest	Mean.	Highst insun's rays.	Lowst on the grass.	Direction of the Wind. A.M.	P.M.	Mean. amt. of Cloud (0—10)	Rain.
	in.	°	°	°	°	°				in.
1	28·732	51·7	29·4	38·8	62·1	23·8	S.	W.S.W	10·0	0·21
2	29·279	47·4	34·3	40·6	100·9	34·0	N.N.W	N.N.W	3 3	0·03
3	·329	52·2	37·4	43·5	58·4	32·3	S.	S.W.	10·0	0·05
4	·318	51·6	40·2	45·8	68·0	40·2	W.	W.	10·0	0·03
5	·422	49·9	41·1	44·9	65·9	37·8	N.N.W	E.N.E.	10·0	0·40
6	29·557	46·9	35·5	39·1	88·4	29·3	E.N.E.	S.W.	8·0	
7	28·834	53·2	37·2	42·9	70·1	37·2	S.	W.	10·0	0·24
8	29·199	49·8	34·5	41·1	109·5	30·3	S.W.	S.W.	2·0	0·17
9	29·192	48·4	38·0	42·4	81·5	35·4	S.W.	S.W.	6·5	0·14
10	28·955	42·7	33·2	36·1	97·3	31·1	W.	W.	8·5	0·05
11	·750	47·3	32·2	39·2	80·3	29·1	W.	N.W.	8·0	0·04
12	28·953	45·0	32·0	36·9	102·0	29·9	N.	N.	5·0	0·03
13	29·078	44·4	24·7	33·7	112·5	24·3	N.	N.W.	3·0	0·12
14	·275	39·3	29·3	33·4	61·1	27·3	S.	S.	10·0	0·05
15	·369	42·5	31·9	36·5	58·7	28·0	E.	E.	10·0	0·73
16	·281	40·2	33·0	35·0	42·5	32·3	E.	E.	10·0	
17	·406	44·7	34·2	37·8	86·5	34·5	W.	N.W.	9·5	
18	·455	47·0	35·0	39·2	58·3	31·3	E.N.E.	E.	10·0	
19	·452	42·1	34·2	36·8	49·4	34·2	E.N.E.	E.	10·0	
20	·546	42·8	34·5	37·6	78·8	31·5	E.	E.	10·0	0·08
21	·447	38·4	33·1	34·9	63·5	26·6	E.N.E.	E.	10·0	0·08
22	·459	47·2	31·1	37·9	102·1	26·8	E.S.E.	S.E.	10·0	0·01
23	·493	50·1	34·0	40·5	95·4	29·6	S.E.	S.E.	7·5	
24	·573	54·1	36·8	43·2	89·0	30·9	N.E.	N.E.	9·8	
25	·657	59·2	36·4	47·0	113·2	28·9	E.	E.	2·0	
26	·680	60·6	34·6	45·7	113·0	29.3	E.	E.	0·0	
27	·563	57·6	36·2	45·0	116·8	29·7	E.	E.S.E.	0·0	
28	·468	63·8	30·4	46·7	124·7	29·9	E.	E.S.E.	2·0	0·01
29	·505	60·2	39·4	47·2	113·5	33·4	S.	E.	5·0	0·15
30	·438	63·3	40·4	49·6	118·1	34·0	E.S.E.	W.S.W	9·5	0·05
31	·281	53·8	31·4	41·7	96·7	30·3	S.W.	S.W.	9·7	
Means.	29·321	49·6	34·4	40·7	86·4	31·1			7·4	Sum 2·62

APRIL, 1873.

Days of Month.	Mean Readg. of Baromtr. reduced to 32°	Temperature. In the Shade. Highest.	Lowest.	Mean.	Highst. insun's rays.	Lowst. on the grass.	Direction of the Wind. A.M.	P.M.	Mean amt. of Cloud (0—10)	Rain.
	in.	°	°	°	°	°				in.
1	29·515	56·1	37·1	45·1	129·0	30·5	S.	W.S.W	5·0	
2	·776	55·4	29 0	41·9	119·8	23·3	W.	N.W.	8·5	
3	·789	53·4	36·1	43·8	109·1	28·5	W.	N.NW.	9·8	0·07
4	·662	54·2	39·4	45·5	79·7	31·2	WSW	W.	10·0	
5	·380	53·4	47·2	48·4	105·1	46·5	S.W.	N.W.	10·0	0·26
6	·178	50·8	35·1	41·7	118·1	29·6	N.N.W	N.W.	5·2	
7	·414	46 8	33·2	39·1	82·2	30·1	N.	N.	8·5	0·03
8	·637	49·0	32·0	39·4	114·4	22·7	N.	N.	8·3	0·02
9	·825	47·8	35·7	40·0	87·0	31·1	N.E.	N.E.	8·5	
10	·804	51·2	34·0	41·1	110·1	29·9	E.N.E.	E.N.E.	4·8	
11	·643	45·6	32·8	38·2	63·8	26·1	N.E.	N.E.	10·0	
12	·614	47·8	38·5	41·6	75·5	37·3	N.E.	N.E.	10·0	
13	·477	50·0	39·6	43·0	96·3	38·1	S.S.E.	S.	10·0	
14	·355	65·2	36·8	49·1	117·1	29·4	S.E.	S.	6·5	0·02
15	·204	68·1	45·2	55·7	136·5	36·9	E.	S.	5·5	0·21
16	·101	73·3	41·2	57·0	143·0	34·1	S.S.E.	S.E.	6·0	0·28
17	·115	59·4	45·8	50 1	101·3	45·6	N.	N.E.	10·0	0·07
18	·284	59·8	44·2	49·0	105·6	45·4	N.E.	S.E.	10·0	
19	·567	57·6	38·7	47·0	121·1	31·1	E.S.E.	N.E.	1·0	
20	·699	62·5	33·9	47·1	131·5	25·9	N.E.	N.E.	2·0	
21	·696	59·8	38·2	46·6	136·0	32·3	N.E.	N.E.	5·5	
22	·522	49·3	35·2	40·8	96·6	29·1	N.E.	N.E.	10·0	
23	·465	47·8	35·0	40·0	123·1	33·1	N.E.	N.E.	6·5	0·04
24	·478	45·8	28·7	36·4	120·0	18·8	N.	N.	8·0	0·03
25	·691	43 5	30·1	34·7	109·3	26·3	E.	E.	8·4	0·05
26	·790	47·7	30·2	36·9	115·8	30·1	E.N.E.	N.	8·0	0·12
27	·560	48·8	32·9	39·1	99·3	28·5	N.N.W	E.	9·5	0·06
28	·707	53·1	36·1	44·4	101·2	31·8	N.	WNW	7·0	
29	·666	56·9	43·8	48·6	117·2	37·8	N.	N.	9·7	
30	·732	60·3	37·4	47·7	119·0	29·4	WNW	N.	10 0	
Means.	29·545	54·0	36·8	44·0	109·5	31·7	...	...	7·6	Sum 1·26

MAY, 1873.

Days of Month	Mean Readg of Baromtr. reduced to 32°	Temperature. In the Shade. Highest	Lowest	Mean.	Highst insun's rays.	Lowst on the grass.	Direction of the Wind. A.M.	P.M.	Mean amt of Cloud (0—10)	Rain.
	in.	°	°	°	°	°				in.
1	29·676	64·1	50·1	55·6	136·7	46·2	N.	N.	5·5	
2	·553	60·5	34·4	46·3	118 3	29 7	W.	W.	7·0	0 03
3	·240	55·6	37·4	45·6	129 9	31·4	W.	N.W.	9·2	0·41
4	29·298	53·4	32 9	41·9	133·5	28·7	N.	N.	6·5	0·15
5	28 948	53·6	43·2	47·0	99·7	39·2	S.W.	S.	9·5	0.06
6	29·091	53·9	37·1	44·0	123·0	32·9	W.	W.	6·8	0·30
7	·059	52·3	40·0	43·8	98·3	37·8	W.S.W	S.W.	10·0	
8	·153	54·2	41·2	46 4	112·3	37 9	N.W.	N.W.	9·5	
9	·555	56·1	34·3	45·1	113·5	30·4	W N W	N.W.	7·7	
10	·668	60·5	37·3	47·2	124·8	30·9	W.	S.	10·0	0 02
11	·707	63·5	50·3	54 7	128·3	48·3	W.	W.	9·8	
12	·737	67·0	46·5	54·8	149·7	44·4	N.N.W	N.N.W	0·5	
13	·701	60·0	39·5	49·3	139·9	32·9	E.	E.	3·5	
14	·725	54·8	32·2	42·4	141·0	31·4	E.	E.	6·3	
15	·585	58·2	30·3	43·9	134·7	29·3	E.	S.E.	2·2	
16	·437	60 9	37·2	48 0	131·0	30·9	E.S.E.	E.	0·5	0·11
17	·143	60·0	40·6	47·5	119·5	37·6	E.	S.E.	9·8	
18	·173	48·1	43·2	44·5	67·7	43·1	E.	E.	10 0	
19	·518	51.6	39·1	43·1	116·3	40·0	E.	N.	9·5	0·14
20	·821	60·9	26·7	43·6	136·3	24·3	E.	W.S.W	4·0	0 08
21	·594	51·0	44 9	46·9	75·9	40·9	S.W.	W.	10·0	0 09
22	·500	62·6	47·3	52·5	139 4	45·3	W.	N.W.	7·5	0 01
23	·314	65·6	46·7	52·7	130·3	41·9	W.	N.W.	9 8	
24	·600	60·8	40·0	48·8	145 3	34 0	N.N.W	N.W.	6·0	
25	·775	62·5	33·2	48·0	153·0	28·2	N.N.W	S.	5·5	0 18
26	·461	63·0	47·1	53·5	126·1	37·3	S.	W.	10·0	0·14
27	·378	59 6	47·3	51·3	136·0	42 9	N.W.	N.W.	8·9	
28	·777	61·5	43·2	51·1	140 0	36·8	E.N.E.	E.	5·5	
29	·911	62·8	46 2	53·0	139.6	41·1	N.W.	W.	7·5	
30	·773	60·9	42·5	51·2	145 2	36·9	E.	E.	8·5	0·17
31	·735	65·2	34·4	49·8	152·2	28·3	E.	N.	0·2	
Means.	29·503	58·9	40·2	48·2	127·0	36·2	...	...	7·0	Sum 1·89

JUNE, 1873.

Days of Month	Mean Readg. of Baromtr reduced to 32°	Temperature. In the Shade: Highest.	Lowest.	Mean.	Highst insun's rays.	Lowst. on the grass	Direction of the Wind. A.M.	P.M.	Mean amt. of Cloud. (0–10)	Rain
	in.	°	°	°	°	°				in.
1	29 484	55·2	46·0	49·0	116·0	37·5	N.	E.	10·0	0·14
2	·580	63·3	45·6	52·0	139·1	42·1	E.	E.	9 0	0·03
3	·382	65·0	46·7	52·6	141·1	43·7	E.	S.	8·5	0 06
4	·388	69·7	39·4	54·3	158·0	37·3	S.	S.	8·5	
5	·388	66·8	56·3	59·6	152·6	56 3	E.S.E.	E.N.E.	8·5	
6	·606	56·5	52·4	52·6	86·9	52·4	E.	E.	10·0	
7	·801	60·4	40·4	49·6	150 1	35·5	E.	E.	9·5	
8	·750	60·8	46·4	52·7	115·2	40·4	N.	N.	8·5	
9	·579	65·9	50·1	56·1	143·0	40·4	W.	W.	9 0	0·15
10	·305	59·3	49·1	52·6	121·0	40·5	W.	S.	10·0	
11	·220	64·8	48 9	54·2	142·8	47·4	W.S.W.	W.	8·5	0·06
12	·063	62·6	48·0	54.1	128·5	44 0	S.	S.	10·0	0 32
13	·191	62·3	48·9	52·9	128·2	43·7	N.N.E.	W.N W	6·0	
14	·276	60·3	39·4	49·5	119·8	34·8	S.W.	S.	10·0	
15	·384	64·7	49·5	55·3	151·0	48·9	N.	S.	8 5	
16	·497	65·4	50·4	56·0	153·8	46 9	W.N W	W.	6 8	0 03
17	·533	71·6	44·2	56·6	159 2	39·1	N.N.W	S.S.E.	7·0	
18	·564	68·6	50·4	57·2	145·0	44·4	S W.	W.	10·0	0·07
19	·614	63·4	53·3	56·1	90·3	47·9	S.W.	S.W.	10·0	
20	·744	71·1	54·5	59·7	146·0	54·0	N.W.	N.W.	5·2	
21	·797	72·4	54·6	61·6	156·7	48·3	S.W.	N.	10·0	
22	·627	72·7	60·4	63·5	148·5	55·8	S.W.	S.W.	10·0	
23	·637	65·6	49·5	56·3	144·5	44·4	N.	N.W.	6·5	0 09
24	·539	64·9	45·1	53·5	101·2	40 9	S.W.	W.	10·0	
25	·429	65·4	54·7	58 0	122·0	50·4	N.W.	N.	9·3	
26	·726	62·8	42·1	52·1	99·3	37·5	W.	N.W.	10·0	
27	·685	64·7	55·1	59·1	108 9	37·6	N.W.	N.W.	10·0	
28	·591	65·5	55·2	58·4	133·4	37·5	W.	N.NW	9·5	0·51
29	·442	75·0	44·7	57·0	156·9	40·8	S.	S.	5·5	0·16
30	·377	61·8	55 3	55·9	131·0	52·9	N.	N.	10·0	
Means	29·507	65·0	49·2	55·3	133·0	44·1	...	...	8 8	Sum 1·62

JULY, 1873.

Days of Month	Mean Readg. of Barom r reduced to 32°	Temperature. In the Shade. Highest.	Lowest.	Mean.	Highst insun's rays.	Lowst on the grass.	Direction of the Wind. A.M.	P.M.	Mean amt. of Cloud (0—10)	Rain.
	in.	°	°		°	°				in.
1	29·537	68·3	48·1	57·3	142·0	45·1	N.	N.W.	5·5	0·02
2	·574	69·0	45·4	56·4	134·2	43·3	S.W.	S.W.	8·0	0·02
3	·410	66·6	56·5	60 3	123·8	42·5	S.W.	S.W.	10 0	0·22
4	·288	65·4	50 3	56·4	132·9	45·1	N.W.	S.W.	6·0	0·04
5	·299	66·9	43·1	53·7	118·9	38·3	S.	S.W.	10·0	
6	·464	67·4	53·6	58·9	146·1	38·4	N.W.	W.	6·5	
7	·640	73·5	42·0	57·7	142·7	38·3	S.W.	S.W.	0·3	
8	·622	75·1	42·4	58·8	145 0	38·3	W.S.W	S.S.W.	1·5	0·09
9	·681	67·1	47·6	56·9	150·1	41·3	W.	N.N.W	9·2	
10	·448	67·4	54·2	59 5	138·8	41·2	W.	N.W.	7·0	0·09
11	·395	63·8	52·7	56·5	132·2	47·0	W.	W.	10·0	
12	·269	66·8	46·2	55 8	145·9	40·5	W.	S.W.	8·7	0·83
13	·071	60·1	49·2	54·7	113·2	46·6	S.	S.	10·0	0·15
14	·223	64·8	48·1	55·5	140·5	45·3	W.	N.W.	7·0	
15	·321	64·6	49·4	55·4	137·9	46·4	W.	W.	8·5	0·01
16	·645	68·2	49·1	57·7	143·2	43·8	N.W.	N W.	4·5	0 08
17	·624	70·0	56·1	61·8	134·2	53·9	W.	W.S.W	10·0	
18	·460	65·5	58·4	60·3	129·3	57·6	W.	N.W.	5·0	
19	·724	65·6	41·4	53·1	140·0	35·7	N.W.	N.W.	7·5	
20	·713	75·0	53·4	62·4	142 8	47·4	W.	W.	5·0	
21	·689	83·2	50 2	66·1	146·0	44·1	S.	S.	0·0	0·02
22	·529	88·2	60·1	73·6	153·5	52·6	S.	S.	0·5	
23	·511	72·1	61·7	64·7	153·5	58·3	N.	S.W.	6·0	
24	·580	72 9	46·3	59·5	152·5	43·9	W.	W.	8·5	0·36
25	·528	75·7	57·1	64·0	157·2	53·1	S.	S.W.	8·5	0·07
26	·497	76·1	56·2	61·5	148·5	53·6	S.W.	N.W.	7·0	0 09
27	·533	65·7	51·4	55·7	136·5	46·1	W.	N.W.	9 0	
28	·544	69·1	49·5	57·8	141·9	43·1	W.	N.W.	7·0	
29	·473	71·8	44·0	57·9	136·2	39·8	S.	S.E.	7·0	0·05
30	·537	73·8	55·2	63·2	144 3	48·6	S.W.	S.W.	4·0	0·01
31	·547	72·5	59·7	63·6	148·3	56·9	N.W.	W.	7·5	
Means.	29·496	70 1	50·9	59·2	140·4	45·7			6 6	Sum 2·15

AUGUST, 1873.

Days of Month	Mean Reading of Barometer reduced to 32°	Temperature. In the Shade. Highest.	Lowest.	Mean.	Highest in sun's rays.	Lowest on the grass	Direction of the wind. A.M.	P.M.	Mean amt. of Cloud (0—10)	Rain.
	in.									in.
1	29·661	66·7	52·7	57·5	141·0	43·3	W.	N.W.	9·5	
2	·750	67·6	49·0	57·4	146·3	40·4	W.	W.	4·5	
3	·695	68·9	53·1	59·2	142·2	47·3	W.NW	WNW	7·0	
4	·567	69·1	53·9	60·1	127·0	52·5	W.S.W	W.	8·0	0·25
5	·495	71·1	59·1	63·2	130·7	57·5	W.	W.	9·5	
6	·523	68·0	59·3	61·8	129·0	56·9	WNW	W.	9·5	
7	·694	77·3	59·2	63·9	150·6	55·7	W.	W.	5·5	
8	·543	75·7	51·0	62·6	156·0	45·0	WNW	W.	4·5	
9	·518	65·0	52·0	57·2	147·6	43·4	N.W.	N.W.	5·0	0·12
10	·649	61·6	44·3	53·0	132·0	38·2	W.	N.W.	7·5	
11	·508	65·1	53·2	57·6	109·8	52·0	N.W.	W.	10·0	0·10
12	·655	70·0	51·5	60·9	148·0	48·2	N.W.	W.	8·5	
13	·530	68·1	60·4	62·5	137·6	59·3	W.	W.	6·5	0·22
14	·677	71·7	51·4	61·0	145·8	50·0	W.	W.	4·5	0·02
15	·625	74·8	57·7	63·8	133·3	57·1	S.W.	W.	9·0	
16	·481	73·8	58·5	63·5	139·3	58·2	S.W.	N.W.	9·0	0·03
17	·708	67·8	46·7	55·5	148·8	37·7	W.	W.	5·0	0·11
18	·284	62·9	53·0	55·6	128·0	50·0	S.	S.	9·2	
19	·203	67·4	50·7	56·9	148·3	45·8	W.	W.	7·0	
20	·287	61·7	48·2	54·1	126·6	40·1	S.W.	S.W.	9·0	0·19
21	·385	68·6	51·5	58·3	139·8	48·1	W.	W.	6·0	0·04
22	·424	71·2	52·7	60·6	148·1	49·1	S.W.	W.	6·0	
23	·407	71·1	52·1	60·0	144·1	45·7	S.	S.	7·5	0·24
24	·357	72·6	56·2	62·3	148·5	51·1	W.	S.S.E.	9·0	0·26
25	·432	73·8	55·9	63·1	142·0	48·5	S.	S.W.	5·0	0·17
26	·582	67·6	54·0	57·8	123·9	46·1	S.	S.	9·0	
27	·370	61·8	53·9	56·9	132·7	50·6	S.W.	S.W.	7·5	0·21
28	·053	63·2	51·2	53·6	119·0	51·5	S.W.	S.W.	6·5	0·37
29	·250	60·5	47·1	51·4	125·7	41·1	S.W.	W.	7·5	0·09
30	·323	65·8	48·6	55·3	115·6	48·6	S.W.	S.W.	8·0	0·10
31	·399	67·6	55·6	60·2	104·2	55·4	S.W.	N.W.	9·5	0·18
Means.	29·479	68·3	53·3	58·9	135·9	48·9	...	...	7·4	2·70

SEPTEMBER, 1878.

Days of Month.	Mean Reading of Barometr. reduced to 32°	Temperature. In the Shade. Highest.	Lowest.	Mean.	Highst insun's rays.	Lowst on the grass.	Direction of the Wind. A.M.	P.M.	Mean amt. of Cloud (0—10)	Rain.
	in.	°	°	°	°	°				in.
1	29·275	63·7	59·4	59·8	104·8	58·0	S.W.	WNW	9·5	0 63
2	·381	62·2	50·9	54·9	125·3	46 5	W.	W.	8·0	
3	·749	61 3	43·6	52·4	135·9	39·7	W.	W.	6·0	0 35
4	·636	60·1	44·6	51·2	108·0	40·2	W.	N.W.	10 0	0·03
5	·634	58·3	48·1	51·5	120·8	40·9	N.W.	N.W.	10·0	
6	·518	57·3	44·7	50·4	105·6	38·9	N.W.	S.W.	6·0	0·04
7	·316	56 8	44·4	49·3	123·0	40·5	W.	W.	10·0	0·37
8	·372	60 6	43·8	51·2	125·9	40 2	N.W.	N.W.	5·0	0·57
9	·249	60·6	49·5	53·5	97·0	42·1	S.W.	W.	10 0	
10	·285	61·6	51·8	55·5	125·8	48·4	W.	W.	6·0	0 35
11	·358	61·9	52·5	55·7	131·0	50·8	W.	W.	5·5	
12	·448	61·9	43·0	52 2	138·1	43·0	S.W.	W.	6·5	
13	·304	57·6	39·1	48·3	93·9	35 0	S.E.	S.E.	9·5	0·15
14	29·108	60·3	46·7	52·2	121·0	41·5	S.E.	W.NW	6·5	0·29
15	28·831	55·9	45·3	49·8	126 0	42·1	S.W.	W.	7·0	0·06
16	29·329	59·8	43·7	50·7	125·2	36·9	W.	W.	4·0	0 01
17	·247	62·7	46 3	54 7	81·2	41·0	S.W.	W.	10·0	0·01
18	·469	60·0	45·4	52 0	125·6	39·5	S.W.	W.	4·5	0·04
19	·682	61·4	45·4	51·3	81·0	40·5	W.	W.	9·0	0·02
20	·643	66·0	52·7	59·0	115·9	51·6	S.W.	S.W.	8·5	0 04
21	29·830	58·6	54·2	55·8	97 8	50·5	N.E.	N.E.	8·5	
22	30·131	58·2	36·5	47·5	122·8	31·7	E.	E.	2·0	
23	29·946	62·5	37·6	49·5	121·8	30 6	E.	N.E.	2·0	
24	·835	62 7	36·6	49 9	123·1	34 1	E.	E.	2 0	
25	·742	68 0	50·8	57·3	129·3	46·9	E.	S.	5·5	
26	·690	70 0	51 9	56·8	125·8	32·2	S.	S.	1·5	
27	·470	70 8	41·7	56·0	128·6	33·2	S.	S.	0·0	
28	·496	62·2	46·7	53·2	125·2	38 9	N.W.	N.	9·0	
29	·682	56·8	37·3	46·6	104 8	29·8	N.E.	E.	8·5	
30	·576	61·0	39·9	49 8	76 0	35·2	E.	S.	10 0	
Means	994·29	61·4	45·8	52·6	11 ·5	40 7	...	...	6·7	Sum 2·96

OCTOBER, 1873.

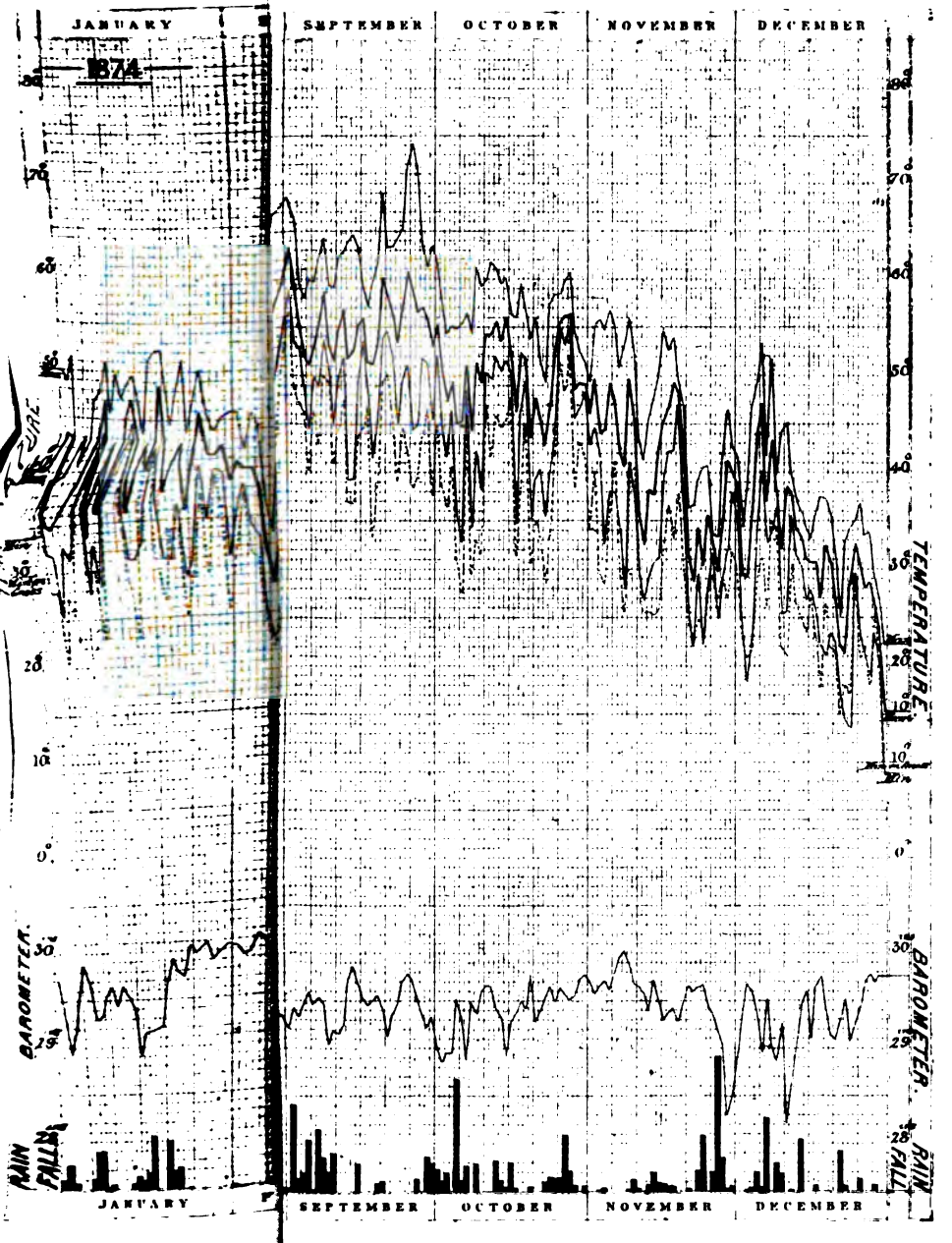
Days of Month	Mean Readg. of Baromtr reduced to 32°	Temperature. In the Shade. Highest	Lowest	Mean.	Highst insun's rays.	Lowst. on the grass.	Direction of the Wind. A.M.	P.M.	Mean. amt. of Cloud (0—10)	Rain.
	in	°	°	°	°	°				in.
1	29·452	66·7	49·5	57·9	89·0	42·2	S.W.	W.	9·5	
2	·525	66·1	49·8	57·2	111·2	43·9	S.	S.W.	9 5	0·07
3	·394	69·7	55·2	61·6	114·8	52·7	S.	S.W.	10 0	
4	·488	57·8	55·1	55 5	68·1	52·6	N.	N.E.	10·0	
5	·615	59·6	48·9	52·7	103·7	33·5	N.E.	N.W.	10·0	
6	·523	60·8	38·4	49 2	115·1	35·6	S.	S.W.	9·0	0·20
7	·185	57·2	48 8	51·5	69 0	46·6	W.	N.	10·0	0 08
8	·292	51·0	32·1	41·2	105·1	31·0	N.	N.	7·5	0·14
9	·375	58·4	28·1	41·3	83 2	26·7	S.W.	S.W.	8·0	0·03
10	·307	62 6	39·9	53·0	76·5	43·3	W.	S.W.	10·0	0·14
11	·321	59·6	55·8	57·1	73·6	55·2	S.W.	S.W.	9·5	0·49
12	·247	54·9	48·1	49·7	63·4	47 3	S.E.	S.W.	10·0	0·59
13	·153	49·3	39·0	41·9	95·2	43·0	S.	S.	9·5	
14	·436	51·6	33·4	43·5	112·1	32·1	S.W.	S.W.	6·0	0·02
15	·539	54·1	31·3	42·4	97·8	30·2	S.	S.W.	9·0	
16	·582	58·6	36·4	46·5	113·9	34·5	S.W.	S.W.	9·0	
17	·640	57·4	30·9	44·0	114·1	30·5	S.	S.W.	9·5	
18	·566	55·4	42·5	50 9	77·8	46·3	S.	E.	10·0	0 02
19	·749	54·9	47·9	50·4	100·8	48·3	E.	N.E.	9·5	
20	·436	55·0	40·6	46·2	108 8	38·9	N.E.	N.E.	5 0	0·10
21	29 305	54·4	32·5	42·1	80·6	29 2	S.W.	S.W.	10·0	0·30
22	28 813	56·6	42·2	49·1	108 2	42·1	S.W.	S.W.	7·5	0·21
23	·513	50·0	40·8	42·5	91·5	41 8	N.W.	W.	9·0	
24	28·790	51·6	28·9	39·5	83·6	27·2	S.W.	S.	7·0	
25	29·036	46·4	28·8	37·6	83·8	29·5	S.W.	E.	9·0	0 01
26	·464	48·0	29 9	38 3	99·9	26·4	E.	N.E.	2·0	
27	29 902	47·2	30·5	38·8	98 8	25·2	N E.	N.E.	3·0	
28	30·005	49·9	21·6	33·6	99·9	22·2	N.E.	N.E.	1·0	
29	29·767	47·6	20 4	32·5	88·9	20·1	N.E.	N.E.	2·0	
30	·478	44·6	20 6	31·4	99·7	21·8	E.	N.	6·0	0·23
31	29·132	53 5	24·7	39·7	79·3	24·8	S.W.	E.	5·0	0·05
Means.	29·388	55·2	37·8	45·8	93·8	36·3			7·8	Sum 2·68

NOVEMBER, 1873.

Days of Month.	Mean Readg of Baromtr. reduced to 32°	Temperature. In the Shade. Highest.	Lowest.	Mean.	Highest insun's rays	Lowst. on the grass.	Direction of the Wind. A.M.	P.M.	Mean amt. of Cloud (0—10)	Rain.
	in	°	°	°	°	°			°	in.
1	28·739	47·6	42·2	44·3	93·9	41·3	E.	N.W.	4·5	0·94
2	28·800	43·9	31·3	38·3	71·7	27·7	S.	S.	9·0	0 02
3	29·012	48·3	32 8	40·6	95·7	32·1	S.E.	E.	8 0	0·14
4	29·062	49·7	23·4	36·9	61·8	24·6	S.	S.W.	6·5	0·70
5	28·915	49·6	33·6	43·1	69·1	30·4	S.E.	S.	7·5	0·18
6	28·880	48 8	42·5	45·4	61·6	36·1	N.W.	N.W.	9 0	0·30
7	29·123	49·1	39·3	44·0	71·2	35·6	N.W.	N.W.	9 5	
8	·462	49·2	42·6	44·5	57·8	41·1	E.	N.E.	10·0	0·11
9	·502	49·3	40·0	43·7	69·5	38·8	S.E.	E.	10·0	0·01
10	·628	48·7	38·4	43·7	58·6	38·9	S.E.	E.	10 0	
11	·746	54·2	40·7	44·1	80·2	35·4	S.E.	E.	5·5	
12	·575	43·3	30·2	37·0	51·2	28·8	E.	S.E.	6·0	0·01
13	·374	43·1	29·9	36 0	53·2	29 3	S.E.	S.E.	9 0	
14	·504	46·8	32·9	40·1	55 8	34·3	E.	E.	9·5	
15	·841	46·9	39·0	41·9	88·2	34·1	E.	E.	5·0	
16	·996	42·3	30·7	37·4	47·5	28 0	E.	N.E.	10 0	
17	·983	43·5	38·0	40·5	52·7	38·8	N.E.	E.	10·0	
18	·877	45·5	39·4	41·8	52·5	39 7	S.E.	E.	10·0	
19	·704	45·6	40·2	42·6	59·8	39·1	E.	S.E.	9·5	
20	·660	43·3	39·6	41·2	47·5	35·2	S.E.	S.E.	10 0	0·11
21	·476	53·2	23·6	34·7	56·8	25·7	S.	W.	9·0	
22	·078	55·5	42·0	48·6	80·4	40 0	N.W.	N.W.	10 0	0 02
23	·250	57·3	45·9	50 9	84·1	38·0	N.W.	N.W.	7·0	0 01
24	·431	51·5	41·5	46·4	71·1	36·8	W.	N.W.	10·0	0 03
25	·676	51·8	31·2	40·8	64·0	31 3	N.W.	S.W.	9·0	0·62
26	·263	54·4	36·2	46·7	58·3	38·1	S.W.	S.W.	10·0	
27	·063	49·4	42·3	44·8	82·5	39·5	W.	N.W.	3·0	
28	·512	52·5	40·8	46·4	59·2	36·3	W.	N.W.	9·0	0·07
29	·291	53·4	43·8	49·2	62·6	42·9	S.W.	S.W.	10·0	0·01
30	29·581	47·8	41·5	44·4	79·1	37 7	N.W.	N.	8 5	0·01
Means.	29·400	48·9	37·5	42·7	66 6	35·2	...	...	8·5	Sum 3·29

DECEMBER, 1873.

Days of Month	Mean Readg. of Bar mtr. reduced to 32°	Temperature. In the Shade. Highest.	Lowest.	Mean.	Highst insun's rays.	Lowst. on the grass.	Direction of the Wind. A.M.	P.M.	Mean amt. of Cloud (0—10)	Rain.
	in.	°	°	°	°	°				in.
1	30·059	48 8	30 2	41·6	55·2	29·4	S.W.	W.	10·0	
2	·056	50 9	41·2	47·2	64·0	39·7	N.W.	N.W.	10·0	
3	·121	47·6	43 0	45 6	52·3	42·0	W.	N.W.	10·0	
4	30·137	44·9	39·4	41·8	49·5	40·5	W.S.W	W.	10·0	
5	29·979	46·7	38·2	42 7	51·7	35·8	S.W.	S.W.	10·0	
6	29·985	44·5	39·4	41·7	52·4	34·1	N.	E.	6·0	
7	30·064	44·8	33·7	39·6	53·5	31·5	E.	S.W.	10·0	
8	·110	45·9	36·1	42·2	61·9	37·5	S.	S.W.	9·5	
9	·096	45·9	20·8	31·4	78·2	24·8	S.	S.W.	1·0	
10	·074	39 0	17·1	27·3	66·1	22·2	S.W.	S.E.	1·0	
11	·143	29·6	15·8	24·0	35·8	21·7	E.	E.	10·0	
12	·152	35·0	16·8	27 6	39·7	21·8	E.	E.	10·0	0·02
13	30·149	33·9	25·6	31·4	38·0	29·2	E.	E.	10·0	0·02
14	29·971	38·1	29 5	32·1	36·8	31·1	E.	E.	10·0	0·02
15	·692	53 7	29 3	40 6	51·0	31·4	S.W.	S.W.	10·0	
16	·463	59·2	39 9	49 9	58·4	35·2	W N W	N.W.	6·5	
17	·740	50·8	39·9	46·8	58·8	33·0	N.W.	N.W.	10 0	0·01
18	·746	51·6	47·6	49·6	55·3	46·0	N.W.	N.W.	10 0	0·11
19	·527	48·7	46·1	47·1	51·3	44·3	S.W.	S.W.	10 0	
20	·505	47·4	34 3	40 3	75·0	31·2	N.	W.	2·0	
21	·675	49·5	34·8	44·4	52·2	32·5	W.	W.	10 0	0·02
22	·598	48·5	45·3	46 3	66·3	42·4	S.W.	W.	10·0	
23	·677	50·8	32·2	41·7	60·0	29·6	W.	W.	9·5	
24	·788	49·9	39·8	45·3	75·2	36·0	W.	W.	7·0	
25	·847	45·9	38·8	42·5	58·2	33·3	S.W.	W.	10 0	0·22
26	·605	47·0	40·7	43·5	83·5	40·6	S.	N.W.	9·5	
27	·389	44·1	34·4	38·5	78·6	34·6	N.W.	N.W.	7·0	
28	·727	32·0	24·3	28·5	47·6	23·6	N.W.	N.	10 0	
29	·532	36·8	22·8	31·2	66·2	23·7	S.	S.	3·5	0·18
30	·323	48·2	25 0	35.6	49 6	24·5	S.	S.	7·5	
31	·133	47·9	33·7	42·5	73·1	27·9	S.W.	W.	4·5	0·28
Means.	29·808	45·4	33·4	39·7	57·9	32·6	...	...	8·2	Sum 0·88


JANUARY
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
1874
TEMPERATURE
BAROMETER.
RAIN FALL
JANUARY
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER

JANUARY, 1874.

Days of Month	Mean Readg. of Bar mtr. reduced to 32°	Temperature. In the Shade. Highest	Lowest.	Mean.	Highst insun's rays.	Lowst. on the grass.	Direction of the Wind. A.M.	P.M.	Mean amt. of Cloud (0—10)	Rain.
	in.	°	°	°	°	°				in.
1	29·707	50·0	33·9	40·2	61·1	30·0	S.W.	S.W.	3·5	0·08
2	29· 28	48·9	33·9	43·3	56·7	31·0	W.	S.W.	9·0	0·25
3	28·934	51·5	39·3	43·0	53·9	35·3	S.	W.	9·5	0·05
4	29·147	39·3	31·9	35·2	63·9	27·8	S.W.	S.W.	6·5	
5	·600	39·6	31·7	34·6	55·8	27·8	W.	W.	3·5	
6	·869	43·1	25·3	35·5	52·0	20·4	W.	S.	8·5	0·10
7	·689	40·5	32 6	36·2	71·7	27·2	S.	S.	6 0	0·38
8	·287	46·9	31·2	38·7	45·7	25·3	S.	S.	10·0	0·39
9	·320	47·7	34·6	43·2	58·8	34·9	S.	S.W.	9·0	0·01
10	·556	50·9	43·3	46·9	57·9	41·1	S.	S.	9.5	0·04
11	·632	45·6	27·7	33·6	79·1	29·8	N.	S.W.	10 0	
12	·430	48·7	32·7	42·6	54·1	30·0	W.	W.	10·0	
13	·635	47·1	28·3	35.9	62·6	22 8	N.W.	W.	4·0	
14	·527	48·6	41 0	45·5	54·9	38·0	W.	S.W.	10·0	0·05
15	29·417	49 5	44 6	47 0	54·7	42·8	S.W.	S.	10·0	0·13
16	28·905	47·7	38 0	43·1	51·6	37·0	S.	W.	10·0	0·09
17	29·155	43·5	31·2	35·9	78·6	29 0	W.	S.	3·0	0·15
18	·166	51·3	31·0	42·7	53·7	22·8	S.	S.	10·0	0.55
19	·183	52·1	32·9	40·0	55·0	40 7	S.	N.W.	10·0	
20	·210	52·2	42 3	48·5	64·7	42 3	S.	S.	10·0	
21	·697	48·5	37·3	43·1	88·3	30·8	W.	W.	2·5	0·50
22	·914	44·5	31·0	36 8	52·1	26·7	W.	S.	10·0	0·18
23	·791	48·9	30·9	40 8	69·0	33 9	S.	S.W.	8 0	0·21
24	29·733	51·2	36.6	42·7	69·5	34·0	N.	N.W.	9·5	
25	30 061	43·8	29·2	35·9	85·9	25·1	S.W.	W.	8 0	0·01
26	29·963	47·0	30·9	40·5	56·2	29·3	W.	W.	9·0	
27	30·035	50·1	40·4	45·8	90·3	37·5	N.W.	N.	3·5	
28	30·088	46·1	34·9	41·5	51·2	29·4	N.	N.	9 0	
29	29 912	43 9	40·0	41·3	44·5	39·4	N.W.	N.W.	10·0	
30	29 985	45·4	39·7	42·4	92·5	36·1	N.	N.W.	9·0	
31	30·052	45.8	31 0	38·8	79·1	25·5	W N W	N.W.	6·5	
Means.	29·582	47·1	34·5	40·7	63·4	31·7	...	...	8·0	Sum 3·17

FEBRUARY, 1874.

Days of Month.	Mean Readg of Baromtr. reduced to 32°	Temperature. In the Shade. Highest.	Lowest.	Mean.	Highst insun's rays	Lowst. on the grass.	Direction of the Wind. A.M.	P.M.	Mean amt. of Cloud (0—10)	Rain.
	in	°	°	°	°	°			°	in.
1	30·030	45·8	35·7	40·7	48·8	32·1	N.	N.W.	10·0	0·01
2	29·935	41·9	38·4	40·0	44·7	37·5	N.W.	N.W.	10·0	
3	29·949	45·6	34 3	40·0	54·1	31·3	N.W.	N.	10·0	
4	30.135	44·4	32·8	37·8	88·8	30·7	E.	S.E.	0 0	
5	30·099	36·4	25·8	31·5	65·9	24 5	S.E.	S.E.	9·5	
6	29·976	33 3	22·5	28·1	48·0	21·4	S.E.	E.	10·0	0·04
7	·840	44·2	23·6	34·0	72·6	27·3	E.	N.W.	9·5	
8	·699	44·2	30·7	37·0	60·8	32·0	N.W.	N.E.	10·0	
9	·837	36·2	23·0	28·3	83·5	23·0	N.E.	N.	5·0	
10	·979	34·3	21·3	28·1	74·8	20·7	E.	S.E.	6·0	
11	·880	35·4	23·3	29 0	86·2	21·5	S.E.	S.E.	9 0	0·06
12	·513	46·0	25·6	35·2	50·6	22·8	S.E.	S.E.	10·0	0·13
13	·482	48·2	33·6	42·1	54 9	34·4	S.W.	S.W.	10 0	0 50
14	29·330	51·4	44·5	47·5	73 3	43·4	S.W.	S.W.	10·0	0·06
15	28·923	54·4	43·3	46·3	93·0	41·0	S.W.	S.W.	9·0	0·20
16	29 022	47·7	42·9	44·8	68·9	40 6	S.W.	N.W.	10·0	0 05
17	28·854	46·2	40·0	42·4	90·1	36·9	N.W.	N.W.	10·0	
18	29·155	43·4	30·5	36·7	95 0	27 7	N.W.	N.N.W	9·5	
19	·577	45·8	29·8	36·9	103·9	28·1	N.W.	N.	5·5	0·01
20	·730	47·8	22·9	34·3	97 0	25·9	N.	S.W.	6·0	0·09
21	·522	44·5	24·6	36·5	58·5	28 3	S.W.	W.	10·0	0·15
22	·272	46·2	40·2	42·8	53·0	39 8	S.	S.E.	10 0	0·02
23	·455	48.1	36·5	41 5	99·4	36·4	N.W.	N.	7·5	
24	·565	44·6	24·8	33·7	96·1	27·5	N.W.	N.E.	10 0	0·18
25	29·253	46·3	30·5	38·4	71·5	30 2	E.	S.E.	8 5	0·88
26	28·655	48·3	40·5	44·2	49·2	37 4	S.W.	S.W.	10 0	0 03
27	28·839	51·7	38·5	44 0	99·8	38·3	S.W.	S.W.	1·5	0·16
28	29·491	51·7	28·3	38·5	106·4	29·4	W.	S.W.	4·0	0·01
Means.	29·534	44·8	31·7	37·9	74·6	31·1	...	...	8·2	Sum 2·67

MARCH, 1874.

Days of Month	Mean Readg. of Baromtr reduced to 32°	Temperature. In the Shade. Highest.	Lowest.	Mean.	Highst insun's rays.	Lowst on the grass.	Direction of the Wind A.M.	P.M.	Mean. amt. of Cloud (0—10)	Rain.
	in	°	°	°	°	°				in.
1	29·467	53·7	40·3	46·3	104·5	40·0	S.W.	S.W.	10·0	0·02
2	29·890	53·0	43·4	47·1	103 6	40·0	S.S.W.	S.	9·5	
3	30·073	41·4	39·2	40·9	55·7	40·4	S.	S.E.	10·0	
4	·382	46·0	35·0	39·8	115·9	35·3	E.	E.	10·0	
5	·075	47·6	33·5	40·5	95·7	32·7	E.	E.	10·0	
6	·249	48·4	35·5	41·5	104·7	33·3	N E.	E.	5·0	
7	30·063	53·5	26·3	38·5	104·2	26·5	E.	N.	0·5	0·09
8	29·578	50·1	24·7	36·1	106·0	26·0	N.	N.W.	5·0	
9	·118	39 5	31·6	34·3	85·6	33·5	N.W.	N.W.	9·0	0·09
10	·285	35·4	22·9	28·2	101·2	29·0	N.W.	N.	5·0	
11	·576	36·0	22·6	28·4	97·5	25·8	N.	N.W.	3·0	0·08
12	·722	44·3	22·6	32·7	83·0	24 8	W.	N.W.	9·5	
13	29·910	48·2	36·5	41·6	92·4	32·0	N.N.W	N.	9·0	
14	30·025	49·0	38·6	43·0	99 8	36·4	N.W.	N.N.W	9 0	
15	29·895	52·2	39 6	44·7	100·1	35·2	N.W.	N.W.	10·0	
16	·858	51·6	41·9	45·8	105·9	39·1	N.W.	N.W.	10·0	0·08
17	·784	53·0	44.6	47·8	80·8	42·2	W.	W.	10·0	
18	·617	55·6	45·7	49·2	112·5	45·1	N.W.	N.	6·5	0·10
19	·501	49·5	29·4	40·0	101·5	29·2	S.W.	W.	10·0	
20	·600	50·9	35·3	42·1	115·8	32·2	W.	N.W.	9·0	
21	·650	53·6	32·3	43·2	93·3	34·1	S.W.	S.W.	10·0	0·01
22	·649	54·6	43·5	48·2	101·1	40·8	W.	N.W.	10 0	
23	·909	61·0	45·9	51·0	119·2	46·6	N.W.	W.	9 0	
24	·850	57·0	40·7	46·7	117·0	37·5	N.W.	N.	10·0	
25	·938	53·3	31·6	41·8	112·2	30·0	N.E.	E.N.E.	3·5	
26	·850	54·2	26·6	39·9	111·0	28·3	E.	S.W.	6·0	0·08
27	·530	60·3	36·4	47·6	115·2	31·3	S.W.	S.W.	7·0	0·07
28	·628	54·3	38·1	45·1	117·5	33·2	W.	S.W.	6·0	0·09
29	·391	54·4	44·1	48·8	87·0	43·7	S.W.	W.	10·0	0.10
30	·497	52·5	43·6	46·5	105·4	39·2	N. W.	N.W.	4·5	0·07
31	·390	53 6	45·6	48·4	84·5	42·3	S.W.	N.W.	10·0	0·09
Means.	29·731	50·7	36·0	42·4	101·0	35·0			7·9	Sum 0·97

APRIL, 1874.

Days of Month.	Mean Readg. of Baromtr. reduced to 32°	Temperature. In the Shade. Highest.	Lowest.	Mean.	Highst insun's rays.	Lowst on the grass.	Direction of the Wind. A.M.	P.M.	Mean amt. of Cloud (0—10)	Rain.
	in.	°	°	°	°	°				in.
1	29·616	53·4	36·5	44·0	109·3	34·2	N.W.	W.	8·0	0·21
2	29·130	54·8	45·1	49·0	88·4	43·4	S.W.	S.W.	10·0	0·17
3	28·887	48 6	44·1	44·8	111·9	42·0	W.	WNW	8·0	0·31
4	28·981	46·1	34·7	39·7	81·8	33·4	S.W.	S.W.	10·0	0·01
5	29·070	51·6	34·0	40·4	123·2	34·3	N.W.	S.W.	6·0	
6	·340	54·5	29·5	41·4	121·6	28·4	N.W.	N.W.	2·5	0·12
7	·520	54·4	29·8	41·3	106·7	29·9	N.	W.	9·5	0·02
8	·465	52·5	37·7	43·6	121·5	37·3	N.W.	N.W.	3·0	0·52
9	29·125	48·2	36·3	42·2	72·9	35·1	S.W.	S.W.	10·0	0·05
10	28·915	50·8	38·8	43·6	121·8	37·5	N.W.	WSW	7·5	
11	28·735	49·8	30·8	39·9	111·2	31·3	S.S.W.	S.S.W.	7·5	0 10
12	29·109	48·5	35·2	41·3	96·2	33·0	N.E.	N.E.	8·0	0·14
13	28·757	49·8	33·2	39·7	111·0	32·8	S.	S.W.	10 0	
14	29·339	50·8	40·1	43·9	90·6	41·6	N.	N.E.	8·5	0·09
15	·610	54·9	40·6	45·7	118·3	41·3	N N E	N.N.E.	5·5	
16	·512	57·0	41·7	48·5	124·6	40·0	N.	N.	7·5	0·04
17	·582	52·7	41·1	46·0	124·3	39·4	N.	N.W.	6·0	
18	·583	58·6	47·1	50·9	126·0	46·6	N.W.	N.W.	10·0	
19	·660	58·5	45·3	50·4	117·6	43·8	N.W.	N.W.	7·0	
20	·609	65·7	33·0	47·8	132·7	34·8	N.W.	N.W.	2·5	
21	·478	72·2	36·5	54·7	127·8	38·0	S.W.	S.	1·5	
22	·632	66·4	40·2	52·3	138·9	38·1	S.W.	E.	5·5	
23	·688	72·5	41·9	55·6	131·2	41·5	E.	S.	5·0	
24	·695	61·2	48·5	53·7	131·2	45 0	S.W.	S.W.	10·0	
25	·677	62 8	52·4	56·5	91·4	50·4	S.	S.E.	10·0	
26	·676	73·5	46·1	57·4	137·9	43·4	S.E.	S.E.	5·5	
27	·689	77·0	48·4	60·3	140·0	45·2	S.E.	S.E.	6·0	
28	·757	66·7	48·9	56·9	134·4	47·7	E.	E.	7·5	
29	·796	58·5	35·7	46·9	133·9	35·4	E.	E.	2·0	
30	·532	65·1	28·2	47.3	139·3	30·4	E.	W.	2 5	
Means.	29·404	57·9	39·4	47·5	117·3	38·5	...	...	6·7	Sum 1.78

MAY, 1874.

Day of Month	Mean Readg of Baromtr. reduced to 32°	Temperature. In the Shade. Highest	Lowest	Mean.	Highst insun's rays.	Lowst. on the grass.	Direction of the Wind. A.M.	P.M.	Mean amt of Cloud (0—10)	Rain.
	in.	°	°	°	°	°				in.
1	29·538	53·2	38·9	45·0	144·6	32·0	N.E.	N.E.	7·5	
2	·617	52·6	31·2	41·7	138 4	25·6	N.E.	N.E.	7·5	0·06
3	·364	49·0	27·3	38·4	129 3	28·4	N.	N.	8·0	
4	·445	46·8	36·2	39·6	132·0	35·7	N.	N.	8·0	
5	·476	48·5	38·7	42·5	103·5	41·0	N.	N.	10·0	0.02
6	·358	54·8	35·6	43·9	120·3	35·4	N.	N.W.	7·0	0·06
7	·243	52·5	32·8	41·9	141·2	33·6	N.W.	N W.	7·5	0·24
8	·186	49·3	32·7	39·1	130·2	34·8	N.	N.	10·0	0·02
9	·221	52·0	29·3	40·3	133 5	28·9	N.E.	N.E.	7·0	
10	·444	50·3	27·9	39·3	132·1	27·3	N.E.	N.E.	8·5	
11	·630	53·5	26·4	40·8	139·9	26·1	N.E.	N.E.	7·0	
12	·765	53·3	40·5	45·7	128·9	40·1	E.N.E.	E.N.E.	8·0	0·03
13	·896	57·3	36·9	45·2	122·7	31·6	E.N.E.	E.N.E.	10·0	0·05
14	·867	58·6	44·6	49·4	124·8	44·3	N.W.	E.	7·5	
15	·660	58·5	47·8	51·7	133·7	45·6	N.W.	E.N.E.	8·5	
16	·892	58·6	26·4	42·1	143·3	27·6	E.	E.N.E.	3·0	
17	·828	60·5	28·5	44·7	146·1	28·0	E.N.E.	E.N.E.	1·0	
18	·783	61·8	28·0	45·0	147·6	27·2	E.	E.	2·0	
19	·783	57·3	37·3	46·5	121·3	35·8	E.S.E.	S.E.	10·0	
20	·718	60·6	40·1	49 3	153·4	36·1	S.E.	E.S.E.	7·0	0·05
21	·444	64·6	40·1	50·5	132·2	37·1	E.S.E.	S.E.	10·0	0·06
22	·179	60·6	45·1	51·0	121·9	43·3	E.	E.	10·0	0 03
23	·051	54·2	49·4	50·0	67·8	50·3	N.E.	N.E.	10·0	
24	·105	66·9	49·3	55·2	150·6	48·0	N.	N.W.	8·5	
25	·323	68·7	45·0	55·2	152·7	42·1	N.N.W	N.W.	7·5	0·06
26	·506	67·8	49·5	55·6	139·8	45·1	S.E.	E.	9·5	
27	·567	68·5	48·7	57·7	130·8	47·2	E.S.E.	N.W.	6·0	
28	·559	63·4	52·8	57·3	102·6	48·6	E.	N.E.	10·0	
29	·524	66·7	53·6	57·7	136·9	51·6	W.	S.W.	10·0	
30	·405	68·4	49·9	57·5	145 0	47·3	S.W.	W.S.W	6·0	
31	·558	68·6	41·4	54·4	148·9	38·5	S.S.W.	W.S.W	6·5	
Means.	29·514	58·3	39·1	47·6	132·1	37·6	...	...	7·7	Sum 0·68

JUNE, 1874.

Days of Month	Mean Readg. of Baromtr reduced to 32°	Temperature. In the Shade. Highest.	Lowest.	Mean.	Highst insun's rays.	Lowst. on the grass.	Direction of the Wind. A.M.	P.M.	Mean amt. of Cloud. (0–10)	Rain
	in.	°	°	°	°	°				in.
1	29·663	66·2	54·0	58·5	119·8	52·0	W.S.W	W.S.W	10·0	0·03
2	·512	75·4	47·3	59·8	149·5	42·9	S.W.	W.	6 5	
3	·720	69·3	52·3	58 0	156·9	51·6	N.W.	W.	9·5	
4	·975	73·8	39·8	56·2	156·1	38·4	S.W.	W.	1·5	
5	·817	74·6	35·3	54·1	168·2	34·6	N.N.W	N.W.	5·0	
6	·647	71·3	48·4	57·4	153·7	46·1	N.N.W	N.E.	9·5	
7	·710	69·4	48·5	57 6	155·7	48·6	W.N W	W.	0·5	
8	·764	73 9	38·1	55·7	162·6	37·7	W.	W.	2·5	
9	·680	80·5	42 0	61·4	154·4	41·0	W.	W.	1·0	
10	·714	67 2	51·6	58·3	130·9	48·5	W.	W.	9·0	
11	·728	69·6	36·3	52·7	153·7	35·1	W.	N.W.	2·5	
12	·885	60 9	43·1	50.4	152·3	38·7	E.	E.N.E.	1·5	
13	·916	58·9	30·6	45·1	144·1	30 9	E.	E.S.E.	5·5	
14	29·941	58·7	33·7	45·5	151·8	33·3	E.	E.S.E.	7·0	
15	30·047	63·4	43·3	51·8	148·3	39·6	N.E.	E.N.E.	2 0	0·19
16	29·829	55·7	48·1	50·0	148·3	49·5	E.N.E.	N.E.	10 0	
17	·673	61·3	47·3	51·3	134·2	47·5	E.N.E.	E.	9·0	
18	·809	58·2	42·9	48·9	128·8	45·5	E.	E.	10·0	
19	·787	69·8	46·9	53·8	152·7	47·2	E.	E.	10·0	
20	·706	59·4	43·6	50·6	116·6	42·6	S.	S.	10·0	
21	·600	66·5	47·6	54·8	158·2	48·0	E.S.E.	E.S.E.	9·5	
22	·493	72·6	45·3	57·7	149·0	38·7	E.	S.	5·0	0 14
23	·502	64·7	44·8	53·8	123·8	43·4	S.W.	S.W.	10·0	0 29
24	·357	60·3	50·1	53·0	136 9	48·2	W.	W.	9·5	0·06
25	·346	64·0	50·1	54·9	145·0	47·9	N.W.	W.	9·0	0·26
26	·176	60·9	49·7	52·7	101·8	50·0	S.E.	S.E.	10·0	
27	·166	67·6	50·4	56·4	148·8	51·6	E.	S.E.	7·5	
28	·291	64·0	50·4	55·9	123·9	49·9	E.	E.	8·0	0·22
29	·444	63·5	45·1	53·0	118·3	44·5	S.W.	S.W.	10·0	0·03
30	·545	71·7	53 6	59·9	140·0	54·1	W.S.W	W.S.W	9·0	0·03
Means	29·648	66·4	45·3	54·3	142·6	44·3	...	...	7·0	Sum 1·25

JULY, 1874.

Days of Month	Mean Readg. of Barom'r reduced to 32°	Temperature. In the Shade. Highest.	Lowest.	Mean.	Highst insun's rays.	Lowst. on the grass.	Direction of the Wind. A.M.	P.M.	Mean amt. of Cloud (0—10)	Rain.
	in.	°	°	°	°	°				in.
1	29·548	69·2	57·8	60·0	126·6	57·5	W.S.W	S.W.	9·5	0·15
2	·380	78·0	55·1	63·0	142·2	53 1	S.W.	W.	6·0	
3	·522	68·7	55·1	60 1	133·9	53·7	S W.	S W.	7·0	0·17
4	·599	66·2	54·0	57 9	138·4	51·6	N.W.	W.S.W	8·5	0·02
5	·750	67·2	50·2	56·6	143·7	47·6	N.W.	N.W.	5·5	
6	·798	70 0	40·4	55·0	151·1	42·1	S.E.	S.	6·5	
7	·650	74·5	44·5	58·9	153·5	44·4	S.	S.	1·5	
8	·635	78·5	44·5	60·7	153·3	44·0	S.W.	S.W.	1·0	
9	·662	85·7	46·0	65·1	158·9	45 0	W.N W	N.W.	0·0	
10	·640	79·8	55·9	66·7	159·4	54·5	N.	N.	9·5	
11	·552	73·4	58·1	64·0	141·8	57·1	N.	N.	10·0	
12	·573	76·8	50·0	61·8	159·6	48·0	N.E.	N.W.	1·5	
13	·644	77·1	57·1	64·5	160·1	53·5	W.	S.W.	9·5	
14	·585	77·1	56·4	65·2	157·3	55·3	W.	N.W.	5·0	
15	·667	78·7	48·1	63·0	167 0	45·4	S.E.	E.	5·5	
16	·709	76·8	54·0	64·5	151 1	40 7	S.E.	S.E.	4·5	
17	·767	78·5	50·9	63·4	155·8	45·6	S.S.E.	S.	0·0	
18	·755	79·1	45·8	61·7	163·1	44·5	S.E.	S.E.	0·0	
19	·599	86·6	42·9	64·1	166·8	42·0	S.S.E.	S.	0 0	0·03
20	·437	79·3	53·0	65·4	162 7	49·7	N.	N.W.	5 0	0·02
21	·335	69·9	56·1	60·8	154·1	52·5	W.	W.	9·5	
22	·460	67·0	52·5	58·7	135·3	47·6	N.W.	W.	8·5	
23	·380	69·2	51·2	59·2	153·2	48·4	N.W.	W.	6·0	0·13
24	·311	66·1	46·1	54·3	153·7	44·4	N.W.	N.	6 8	0·38
25	·468	73·1	46·9	58.6	157·6	43·1	N.	N.	4 0	
26	·242	67·5	53·4	59·1	132·3	54·1	W.	N.W.	6·0	0·41
27	·271	69·8	51·1	58·1	141·0	49 6	W.S.W	W.S.W	10 0	0·09
28	·146	68·8	53·8	59 0	139·8	52·7	S.W.	S.W.	8·0	
29	·268	71·0	42·5	57·0	148·8	41·8	N.	N.W.	4·5	
30	·511	70·4	43·1	56·8	147 3	41·4	W.	W.	2·5	0·05
31	·574	65·8	45·5	56·3	114·0	42·5	W.	S.W.	7·7	0·02
Means.	29·530	73·5	50·4	60·7	149·1	48·2			5·1	Sum 1·47

AUGUST, 1874.

Days of Month	Mean Readg. of Baromtr. reduced to 32°	Temperature. In the Shade. Highest.	Lowest.	Mean.	Highst insun's rays.	Lowst on the grass.	Direction of the wind. A.M.	P.M.	Mean amt. of Cloud (0—10)	Rain.
	in.									in.
1	29·477	69·6	57·5	61·4	140·9	56·3	N.W.	N.W.	9·5	
2	·338	72·1	59·4	64·1	130·8	61·2	W.	W.	9·5	
3	·498	67·0	43·9	55·0	148·1	...	W.S.W	S.W.	6·0	0·10
4	·359	63·5	48·0	54·0	110·0	44·3	S.W.	S.W.	7·5	0·11
5	·272	60·5	49·7	52·9	97·5	37·7	S.W.	S.W.	10·0	
6	·442	67·6	51·0	57·6	143·0	45·7	N.	W.	0·7	0·25
7	·331	71·8	51·5	61·2	133·6	47·5	S.W.	S.W.	9·5	0·03
8	·211	63·6	52·0	57·1	136·5	48·5	W.	N.W.	6·0	0·30
9	·369	61·6	50·1	55·3	111·7	43·8	N.W.	N.	8·5	0·14
10	·103	64·1	54·7	58·3	130·2	52·3	W.	W.	4·5	0·18
11	·279	61·0	49·7	54·7	134·2	44·4	N.W.	N.W.	6·0	0·36
12	·298	60·0	46·1	52·6	129·8	42·8	N.W.	W.	9·0	0·27
13	·102	64·8	53·0	56·3	114·2	52·8	S.	S.W.	7·5	
14	·092	60·8	51·2	55·5	114·0	47·8	W.	N.W.	8·5	
15	·566	63·8	50·2	55·8	123·0	45·0	N.W.	W.	8·0	0·01
16	·603	62·3	53·0	57·3	96·2	49·7	S.W.	S.W.	10·0	
17	·728	63·8	41·4	52·7	116·7	36·5	N.W.	S.W.	6·5	
18	·825	69·8	44·1	55·8	117·8	39·8	W.	W.NW	6·5	
19	·908	73·6	54·0	63·3	130·8	48·1	S.E.	N.	8·0	
20	·895	78·6	51·1	63·9	141·2	47·5	E.	S.E.	0·0	
21	·997	71·1	54·2	61·1	130·7	47·8	N.E.	N.E.	7·0	
22	·965	72·2	41·2	56·2	144·2	36·0	S.E.	E.	1·5	
23	·854	76·3	38·9	59·1	137·8	34·8	N.	N.E.	0·0	
24	·802	70·1	49·1	58·0	137·8	42·1	S.E.	S.W.	2·5	
25	·588	72·8	55·6	61·9	150·2	51·1	W.	S.	6·0	
26	·580	73·0	49·6	60·3	132·3	42·7	S.	S.W.	3·5	
27	·349	65·4	54·2	58·4	110·3	49·2	S.	S.W.	10·0	0·20
28	·415	65·0	44·1	54·4	139·0	35·8	N.W.	N.W.	3·0	0·13
29	·290	60·0	50·1	53·4	129·2	43·8	S.W.	N.W	7·5	0·10
30	·409	66·8	49·4	56·9	128·8	42·8	S.W.	S.W.	5·5	0·35
31	·345	67·5	54·8	59·5	125·8	50·6	W.	S.W.	6·0	0·04
Means.	29·495	67·1	50·1	57·5	128·0	45·6	...	...	6·3	Sum 2·57

SEPTEMBER, 1874.

Days of Month	Mean Readg. of Baromtr. reduced to 32°	Temperature. In the Shade. Highest.	Lowest.	Mean.	Highst insun's rays.	Lowst on the grass.	Direction of the wind. A.M.	P.M.	Mean amt. of Cloud (0—10)	Rain.
	in.	°	°	°	°	°				in.
1	29·216	68·6	58·8	63·3	115·5	56·6	S.W.	S.W.	6·5	0·04
2	·416	66·4	53·4	59·2	127·0	48·8	S.W.	S.W.	4·0	0·91
3	·344	59·2	53·0	55·2	93·0	47·3	S.	S.	10·0	0·14
4	·465	58·2	48·9	52·1	104·2	46·4	S.W.	S.	8·5	0·19
5	·577	59·8	44·6	51·1	116·2	40·2	W.	N.W.	6·0	0·54
6	·477	59·6	50·0	52·7	116·5	46·5	S.	S.	10·0	0·01
7	·543	62·3	48·9	55·3	95·0	43·0	W.	W.	9·5	0·65
8	·486	64·1	53·7	58·6	108·8	50·0	S.	S.W.	9·0	0 35
9	·036	59·3	50·8	53·1	111·8	49·3	S.E.	W.	8·5	0·20
10	·191	59·1	44·9	51·5	110·2	40·9	W.	N.W.	5·0	0·39
11	·165	62·3	49 9	54·8	88·0	44·6	S.W.	N.W.	10·0	
12	·254	62·7	51·8	56·8	117·0	47·4	N N W	N.N.W	4·5	
13	·729	63·8	39·2	51·7	117·8	37 0	N.	N.	3·0	
14	·873	64·6	39·4	52·5	109·3	36·8	S.W.	S.W.	3 5	
15	·680	63·2	49·2	55·1	100·5	43·8	S.W.	S.W.	8·0	0.28
16	·514	58·8	53·6	56·0	81·0	44·7	S.W.	S.W	10·0	
17	·448	57·1	48·5	51·4	91·7	46·8	N.	N.	9·0	
18	·500	59·8	41·5	51·1	97·0	33·2	W.	N.N.W	8.5	
19	·566	61·6	45·2	53·1	82·8	38·7	W.	W.	10 0	0.08
20	·401	68·9	53·9	60·1	94·7	49·4	S.	S.	6·5	0·10
21	·121	65·4	54·5	58·1	72·3	50 2	S.	S.W.	10·0	
22	·358	63·4	51·7	56·2	94·6	45·3	S.W.	S.W.	7·0	
23	·475	64·2	45·0	53·5	95·2	39·0	S.	S.E.	10·0	
24	·703	65·2	49·5	56·8	85·3	44·7	W.	W.	6·0	
25	·779	72·0	51·1	60·7	105·0	42·2	S.W.	W.	5·0	
26	·717	74·2	44·5	59·2	106·3	38·5	W.	S.S.E.	0·0	
27	·518	71·8	44·9	56·5	100·7	39·5	S.S.E.	S.W.	10·0	0·13
28	·334	63·5	51·8	57·0	86·0	43·7	S.W.	S.W.	10·0	
29	·214	61·2	51·3	55·8	88·8	46·6	S.W.	W.S.W	9·5	0·35
30	·322	63·5	45·7	53·0	91·0	37·7	S.W.	S.W.	3·0	0·29
Means.	29·447	63·4	49·0	55·4	100·1	44·0	...	...	7·3	Sum 4·65

OCTOBER, 1874.

Days of Month.	Mean Readg. of Baromtr. reduced to 32°	Temperature. In the Shade. Highest	Lowest.	Mean.	Highst insun's rays.	Lowst. on the grass.	Direction of the Wind. A.M.	P.M.	Mean amt. of Cloud (0—10)	Rain.
	in.	°	°	°	°	°				in.
1	29·013	61·5	52·0	55·3	100·1	44·8	S.W.	S.	10·0	0·23
2	28·866	57·2	44·6	50·4	71·2	38·5	S.W.	WNW	10·0	0·10
3	·949	54·4	41·6	47·3	86·0	36·5	N.W.	W.	6·5	0·19
4	28·946	55·1	46·5	49·4	74·7	40·6	WSW	N.	8·5	
5	29·512	54·8	35·6	45·0	89·1	30·8	N.W.	N.	6·0	1·17
6	29·349	55·4	32·8	45·3	68·8	27·6	S.W.	W.	10·0	0·10
7	28·896	56·5	48·6	51·0	84·2	46·0	N.W.	W.	6·0	0·27
8	29·484	54·2	34 3	44·3	87·4	29·5	N.W.	W.	3·5	
9	·383	61·1	42·2	51·3	102·0	33·0	S.W.	N.W.	10·0	0·29
10	·605	59·3	38·2	49·3	83·2	31·6	S.W.	W.S.W	8·5	
11	·666	59·8	50·4	54·3	92·7	46·9	W.	W.	6·5	
12	·654	61·7	49·7	54·4	86·3	41·6	S.W.	W.	7·5	
13	·425	61·1	51·9	55·6	74 0	45·8	S.W	W.	10·0	0·32
14	29·330	59·5	50·6	53·6	69·3	44·7	S.E.	S.	10·0	0·12
15	28·938	60·0	51·5	56·1	76·2	45·0	S.W.	S.W.	10·0	0·04
16	29·297	56·2	50·6	52·4	81·6	47·7	N.	N.E.	5·5	0·30
17	·365	56·0	34·8	46·3	61·4	31·4	W.	S.W.	10·0	0·03
18	·493	59·6	46·4	52·5	79·4	38·7	N.W.	W.	5·5	
19	·439	56·4	49·6	51·9	82·7	45·0	W.	W.	3·0	
20	·774	53·7	35·3	43·7	78·6	30·6	N.W.	N.W.	2·5	0·05
21	·174	56·0	39·4	47 8	65·0	34·9	W.	N.W.	9·5	
22	·294	51·1	40·3	45·5	64·7	33·0	N.W.	N.W.	10·0	
23	·565	49·4	35·4	42·8	90·7	28·6	NNW	N.	5·5	0.10
24	·643	57 3	40·3	46 7	104·5	33 5	S.W.	W.	9·0	0·15
25	·492	58 6	43·8	52·5	71·3	42·2	W.	W.	10·0	0·14
26	·635	58·5	54·8	55·4	70·3	51·3	S.W.	W.	10 0	0·14
27	·560	59 8	53·1	56·1	70·4	48·3	S.W.	W.	10·0	0·59
28	·521	60·7	54·9	56·4	104·0	52·1	S.W.	S.S.W.	10·0	0·21
29	·556	54·4	45·6	48·6	90·8	38·3	S.	E.	10·0	0·05
30	·720	52·3	46·6	49·3	71·4	43·1	E.	E.	10 0	
31	·773	51·1	48·3	49·1	59·5	41·7	E.	E.	10·0	0·05
Means.	29·397	56·9	44·8	50·3	80·4	39 5	...	...	8 2	Sum 4.64

NOVEMBER, 1874.

Days of Month.	Mean Readg. of Baromtr. reduced to 32°	Temperature. In the Shade. Hign-est.	Low-est.	Mean.	Highst insun's rays	Lowst. on the grass.	Direction of the Wind. A.M.	P.M.	Mean amt. of Cloud (0—10)	Rain.
	in	°	°	°	°	°				in.
1	29·701	49·4	42·9	46·1	55·4	34·1	E.	S.E.	10·0	
2	·584	55·3	44·6	49·7	59·7	40·0	S.E.	S.	10 0	
3	·660	55·7	34 6	44·0	97·9	29·5	S.	W.	5·0	0·01
4	·702	54·7	32 7	44·4	79·3	28·3	S.W.	S.W.	6·0	0·02
5	·622	56·7	38·0	49·2	83·2	35·4	S.	W.	5·5	
6	·777	55 1	38·0	47·7	70·2	41·0	N.W.	N.	9·0	
7	29·970	50·8	33·8	41·9	99·0	29·6	N.	N.	0 5	
8	30 023	52·7	28·0	40·6	69·4	25·6	N.	W.	10·0	
9	29·891	56·0	41·1	49·7	66·0	39 5	W.	W.	9·5	0·01
10	·681	52 6	38·1	45·7	67·6	40·5	N.W.	N.	6·0	0·12
11	·653	43·2	29·4	35·7	69 7	26·5	N.	N.W.	5 0	0 02
12	·566	41·4	26·7	32·6	66·1	25·5	N.	N.	0·0	
13	·399	45·6	29·4	38·2	64·4	25·5	N.W.	N.	10 0	0 07
14	·720	47·5	30·7	37·8	57·2	25·2	N.	N.	10 0	0·19
15	·488	50·4	31·2	42·4	56·6	25·9	WNW.	N.W.	10·0	0·08
16	·300	54·8	39·9	45·0	79·3	32·8	N.W.	N.N.W	7·5	0·07
17	·378	52·6	42·1	46·5	59·0	36·6	N.	N.	10·0	0·05
18	·417	53 9	42·2	49·2	56·2	33·2	W.	N.W.	10·0	0·05
19	·293	49·7	47·0	48·1	78·8	37·7	W.	N.W.	7·5	
20	·482	46·8	37·4	41·7	80 0	29·0	N.W.	N.	1·5	
21	·666	36·3	25·8	31·1	53·7	24·1	N.W.	S.	10·0	0·02
22	·587	36·5	22 0	28·7	44·0	23 0	S.	S.	8·0	
23	·640	39·3	29 5	34 1	60·4	24·8	S.	E.	7 0	0·21
24	·670	40·5	22·2	30·5	50 1	23·4	S.E.	S.	9·5	0·58
25	·438	40·7	29 0	35·5	41·7	28 0	S.W.	S.W.	10·0	
26	·378	33·6	31·6	32·4	42·7	29·4	S.S.E	S.E.	9 0	0·20
27	·185	33·3	24·9	29 8	61·8	27·0	S.E.	S.E.	10 0	1·40
28	29·035	41·4	29·1	34·1	61·6	29·0	S.E.	S.E.	10·0	0·35
29	28·303	46·5	32·0	41·2	61·8	27·0	S.W.	N.W.	4·5	0·02
30	28 491	42·6	37·9	40·0	54·0	31·8	N.E.	S.W.	8·5	0·05
Means.	29·490	47·2	33·8	40·5	64 9	30 3	...	...	7·7	Sum 3·52

DECEMBER, 1874.

Days of Month	Mean Readg. of Baromtr. reduced to 32°	Temperature.					Direction of the Wind.		Mean amt. of Cloud (0—10	Rain.
		In the Shade.			Highst insun's rays.	Lowst. on the grass	A.M.	P.M.		
	in.	°	°	°	°	°				in.
1	28·955	41·6	35·0	38·3	57·0	30·2	N.	N.	10·0	
2	29·421	34·4	23·5	29·3	50·2	23·0	N.	N.	4·0	
3	·679	38·1	18·3	29·2	69·3	20·8	N.	W N W	2·0	0·01
4	·615	46·8	23.3	35·4	48·8	21·6	N.W.	W.	10·0	0·03
5	29 385	49·3	34·2	43·8	72·0	29·6	S.W.	S.W.	10·0	0·20
6	28·959	53·3	40·1	47·1	56·4	31·2	S.W.	W.	10·0	0·04
7	29·507	41·7	32·7	37·0	67·9	26·1	W.	W.	3·5	0·76
8	29 009	51·7	33·7	43 3	49·2	34·9	S.W.	S.W.	10·0	
9	28·863	39·8	36·4	38 0	48·2	34·4	N.	W N W	9.0	0·29
10	29·264	44·2	25·3	32·0	68·4	21·8	Calm	S.W.	1 0	0·18
11	28·311	45·1	25·5	38·6	59·4	21·0	S.W.	W.	9 5	
12	·638	39·7	35·0	38·0	42·6	30·6	N.	N.	10·0	0·01
13	28·991	36·9	31·3	34·5	40·0	26·4	N.E.	N.E.	10·0	
14	29·455	35·9	30 3	33·1	53·9	25·0	N.E.	N.E.	3·5	0.54
15	·589	34·1	26·8	31·0	39·4	23·5	N.	N.	9·0	
16	·110	33·3	27·7	30·7	43·0	27 0	E.	E.	9·0	
17	·651	35·6	25·4	30·8	41·9	22·8	N.E.	N.E.	9·5	0·06
18	·749	37·6	22·1	27·0	50·6	17·8	N.NW.	N.W.	3·5	
19	·423	37·3	21·1	32·4	43·6	26·4	N.W.	N.	8·0	
20	·138	35·8	23·3	30 6	45·0	21·9	W.	W.	8·0	
21	·093	31·0	22·4	26·1	60·2	21·5	Calm	W.	0 0	
22	·302	25·1	16·7	22·1	33·5	15·0	N.	S.E.	0 0	0 41
23	·508	32·8	14·3	21·3	59·0	18 0	N.E.	N.	0 0	0·05
24	·083	34·3	13·6	28·4	39·3	17·0	S.E.	N.W.	10·0	
25	·267	35·0	29·6	32·6	40·0	28·0	N.NW.	N.E.	10·0	
26	·436	36·8	22·9	30·5	67·0	20·8	N.	N.	6·5	0·13
27	·705	33 5	20·8	28·1	45·8	22·0	N.	N.	4 0	
28	·748	33 6	19·1	28·7	43·8	18·0	N.	N.	9·0	
29	·686	29·4	23·5	26·6	40·8	25·8	S.E.	E.	10·0	0·07
30	·761	26·9	19·5	23·9	35·0	20·8	S.E.	E.	10·0	
31	·758	22·2	8·8	15·2	37·0	10·0	N.E.	E.	5·0	
Means.	29·324	37·2	25·2	31·7	49·9	23·6	...	...	6·9	Sum 2·78

1873.

SUMMARY.

Month.	Mean Reading of the Barometer (reduced to 32°)	Temperature. In the Shade. Highest.	Lowest.	Mean of all the Highest.	Mean of all the Lowest.	Adopted Mean.	Dew Point.	Mean of all the Highest in the sun's rays.	Mean of all the Lowest on the grass.	Degree of Humidity (Saturation = 100)	Wind. Proportion of N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Amount of Cloud.	Rain. No. of Days it fell.	Amount collected.
	in.	°	°	°	°	°	°	°	°												in.
January	29·256	53·0	23·3	45·1	36·2	40·6	38·0	58·7	32·6	90	0	0	5	1	6	13	4	2	7·4	22	4·13
February	·614	48·5	22 9	38·6	30·4	33·9	31·4	55·9	29·1	90	8	2	8	3	1	1	3	2	9·0	12	1·53
March	·321	63·8	24·7	49·6	34·4	40·7	37·7	86·4	31·1	89	3	2	10	3	3	4	4	2	7·4	20	2·62
April	·545	73·3	28·7	54·0	36·8	44·0	37·2	109·5	31·7	76	7	9	3	3	2	1	2	3	7·6	13	1·26
May	·503	67·0	26 7	58·9	40·2	48·2	41·3	127·0	36·2	77	4	0	8	2	2	2	7	6	7 0	14	1·89
June	·507	75·0	39·4	65·0	49·2	55·3	49·6	133·0	44·1	82	5	1	4	1	5	4	5	5	8·8	11	1·62
July	·496	88·2	41·4	70·1	50·9	59·2	50·8	140·4	45·7	74	2	0	0	0	5	8	9	7	6·6	16	2·15
August	·479	77·3	44·3	68·3	53·3	58·9	51·9	135·9	48·9	78	0	0	0	0	4	7	15	5	7·4	17	2·70
September	·499	70 8	36·5	61·4	45·8	52·6	47·4	115·5	40·7	82	1	2	4	1	3	5	10	4	6·7	15	2·96
October	·388	69·7	20·4	55·2	37·8	45·8	43·4	93·8	36·3	92	2	6	3	1	4	12	2	1	7·8	16	2·68
November	·400	57·3	23·4	48·9	37·5	42·7	39·2	66·6	35·2	87	1	1	8	6	2	3	2	7	8·5	17	3·29
December	·808	59·2	15·8	45·4	33·4	39·7	37·2	57·9	32·6	91	1	0	5	1	3	8	7	6	8·2	9	0·88
Year	29·485	88 2	15·8	55 0	40·5	46·8	42·1	98·4	37·0	84	34	23	58	22	40	68	70	50	7·7	182	27·71

1874.

SUMMARY.

Month.	Mean Reading of the Barometer (reduced to 32°)	Temperature. In the Shade. Highest.	Lowest.	Mean of all the Highest.	Mean of all the Lowest.	Adopted Mean.	Dew Point.	Mean of all the Highest in the sun's rays.	Mean of all the Lowest on the grass	Degree of Humidity (Saturation = 100).	Wind. Proportion of N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Amount of Cloud.	Rain. No. of Days it fell.	Amount collected.
	in.	°	°	°	°	°	°	°	°												in.
January	29·582	52·2	25·3	47·1	34·5	40·7	38·7	63·4	31·7	93	3	0	0	0	9	6	9	4	8·0	17	3·17
February	·534	54·4	21·3	44·8	31·7	37·9	35·3	74·6	31·1	91	3	1	3	5	1	7	1	7	8·2	17	2·67
March	·731	61·0	22·6	50·7	36·0	42·4	37·7	101·0	35·0	84	4	1	4	1	1	6	4	10	7·9	13	0·97
April	·404	77·0	28·2	57·9	39·4	47·5	40·9	117·3	38·5	79	3	2	4	2	3	7	2	7	6·7	12	1·78
May	·514	68·7	26·4	58·3	39·1	47·6	40·4	132·1	37·6	76	5	8	7	3	0	2	1	5	7·7	11	0·68
June	·648	80·5	30·6	66·4	45·3	54·3	45·6	142·6	44·3	72	1	2	8	3	1	4	8	3	7·0	9	1·25
July	·530	86·6	40·4	73·5	50·4	60·7	49·6	149·1	48·2	67	5	0	1	3	3	6	7	6	5·1	11	1·47
August	·493	78·6	38·9	67·1	50·1	57·5	49·4	128·0	45·6	76	2	2	1	2	2	9	6	7	6·3	15	2·57
September	·447	74·2	39·2	63·4	49·0	55·4	50·9	100·1	44·0	85	3	0	0	2	5	12	6	2	7·3	16	4·65
October	·397	61·7	32·8	56·9	44·8	50·3	47·0	80·4	39·5	89	2	1	2	0	2	8	10	6	8·2	21	4·64
November	·490	56·7	22·0	47·2	33·8	40·5	37·8	64·9	30·3	90	7	1	1	4	4	3	4	6	7·7	19	3·52
December	·324	53·3	8·8	37·2	25·2	31·7	29·3	49·9	23·6	91	10	5	2	2	0	4	5	3	6·9	14	2·78
Year	29·508	86·6	8·8	55·9	39·9	47·2	41·9	100·3	37·5	83	48	23	33	27	31	74	63	66	7·2	175	30·15

SUMMARY OF THE WEATHER FOR 1875.

JANUARY.

"If January calends be summerly gay
It will be winterly weather till the calends of May."

The severely cold weather which set in during the latter part of November and continued all through December, broke up on the evening of the 1st of January, and was followed by remarkably warm weather, which lasted till the 30th. The mean temperature (as deduced from the mean of the maxima and minima) during this interval, was as high as 44°0, being almost 13° above that for December. The highest temperature of the month, 52°7, occurred on the 18th, and the lowest, 28°5, on the 22nd. Temperatures above 50° were recorded on 12 days, while there were only two readings below 30°, viz., on the 22nd and 31st. The Northerly winds which had been prevalent during December gave way to winds from the S.W. Rain fell daily from the 1st to to the 4th, and from the 10th to the 29th inclusive; the total amount measured being 4·53 inches. A thunderstorm occurred on the 25th. The mean reading of the barometer reduced to 32° and at sea-level, was 29·934 in.; the mean maximum temperature 47°6, and the mean minimum 39°5.

FEBRUARY.

"On the eve of Candlemas day
Winter gets stronger or passes away."

The latter proved to be the case this year, for on January 31st a cold period set in, which continued, with slight exceptions, till March 23rd. The mean temperature of the month was only 35°4, being 8°0 lower than that of January. A maximum of 50° and above was only recorded on two days, while the minimum was below 30° on 15 occasions. The general direction of the wind was East. Rain or snow fell on 13 days, amounting to 2·13 inches; the greatest fall, 0·62 inch, occurred on the 6th. The mean atmospheric pressure was 30·067 in. The maximum temperature, 52°4, took place on the 14th, and the minimum, 28°6, on the 9th.

MARCH.

"March many weathers."

As previously mentioned, the first part of this month was cold: the mean temperature of the whole period from January 31st to March 23rd, an interval of 52 days, was only 36°5. A warm period set in on March 24th and continued till April 6th. The maximum temperature, 55°2, occurred on the 31st, and the minimum, 27°7, on the 16th; the mean for the month was 40°7. The temperature fell below the freezing point on 12 occasions. The general direction of the wind was from N.—E. Rain fell on 8 days only, amounting to 1°33 inch. Atmospheric pressure was generally very high, the readings from the 8th to the 31st (with only two exceptions) being above 30 inches; the mean for the month was 30°182 in.

APRIL.

"Changeable as an April day."

The weather during this month was alternately mild and cold;—the mean temperature from the 1st to the 6th being 46°4, from the 7th to the 16th, 42°7; from the 17th to the 21st 52°1; and from the 22nd to the 26th, 45°1. A warm period set in on the 27th which continued throughout the month of May. A very sudden fall of temperature took place about noon on the 21st, and was general all over the country; a change of nearly 20° occurring at some places in less than an hour. The mean temperature of the month was 46°4; the maximum, 71°0, occurred on the 20th, and the minimum 28°5, on the 14th. Rain fell from the 3rd to the 10th, and on three other days, the total amount being 1°64 inch. The wind blew almost persistently from the East from the 8th to the 24th. Atmospheric pressure, which had been unusually high during the latter part of the previous month, decreased from 30.56 in. at 9 a.m. on the 1st to 29·26 in. at 9 a.m. on the 5th: the mean for the month was 30·075 inches.

MAY.

"The merry month of May."

May was fine, dry, and warm;—the warm period which set in at the end of April continuing throughout the whole of the month. The mean temperature was 54°0, being more than 7°5 above that of the preceding month. The day temperatures from the 11th to the 17th were high,—those from the 15th to the 17th being 72°7, 75°9, and 79°2 respectively—the last was the maximum for the month. The night temperatures were also comparatively high, the lowest being only 38°0 on the 3rd. It is a somewhat remarkable circumstance that no frost should have occurred during this month. The changes in atmospheric pressure were not large; the mean for the month was 30·038 inches. Rain fell on 13 days, amounting to 2·51 inches. On the 28th thunderstorms passed over Marlborough, both in the morning and afternoon.

JUNE.

"Midsummer rain
Spoils hay and grain."

The warm weather which prevailed during the preceding month continued till the 9th, when a cold period set in; the mean temperature from the 1st to the 9th was 61°0, and from the 10th to the 30th 56°6. The maximum, 79°9, occurred on the 3rd, and the minimum, 40°5, on the 22nd; the mean was 58°0. The general direction of the wind was W. and S·W. Rain fell on 18 days, amounting to 2·78 inches. On the 9th a severe thunderstorm passed over the district, which did considerable damage. The changes in atmospheric pressure were small; the mean, however, was low, being only 29·935 inches.

JULY.

"In this month is St. Swithin's day,
On which if that it rain they say,
Full forty days after it will,
Or more or less some rain distil."

This month was remarkable for the very heavy rain which commenced on the 14th and continued for more than 30 hours without intermission. The rainfall for the 14th and 15th amounted to 2·98 inches, of which 2·32 inches fell on the 14th. This heavy rainfall was general all over England (except in the northern counties), and was greatest in Monmouthshire, where more than *five inches* fell in 24 hours. The cold weather which set in on June 10th continued throughout the whole of July. The mean temperature was 58°5, being only about half a degree above that of the preceding month; the maximum, 76°7, occurred on the 29th, and the minimum, 39°6, on the 13th. Rain fell on 13 days; the total amount being 5·61 inches. The mean atmospheric pressure was 29·998 inches.

AUGUST.

"Dry August and warm
Doth harvest no harm."

The first five days of this month were cold, the mean temperature being only 56°0; a warm period then set in, which continued during the remainder of the month, the mean from the 6th to the 31st being 62°8. The maximum, 81°9, occurred on the 16th, and the minimum, 41°2, on the 1st; the mean for the month was 61°7. The prevalent direction of the wind was N.E. from the 1st to the 7th, after which it was generally W. and S.W. The number of rainy days was 13, and the amount 2·12 inches, of which 0·97 inch fell on the 12th during a thunderstorm. Atmospheric pressure was very steady, the range being less than 0·7 inch; the mean for the month was 30·064 in.

SEPTEMBER.

"August ripens, September gathers in."

This month was warm and for the most part fine. The mean temperature was 59°6, being only 2° below that of August. The interval from the 11th to the 19th was very fine, bright, and warm; the mean day temperature being 71°8, and night 52°0. Rain set in on the 19th and fell daily to the end of the month. The total fall for the month was 3·78 inches, and the number of rainy days 17. Thunderstorms occurred on the 19th and 24th. Atmospheric pressure was generally high for the first part of the month, but it became somewhat disturbed after the 21st; the highest reading, 30·34 in., took place on the 6th, and the lowest, 29·53 in., on the 26th; the mean for the month was 30·060 in. The maximum temperature, 78°0, occurred on the 18th, and the minimum, 41°2, on the 11th.

OCTOBER.

"Dry your Barley in October
Or you'll always be sober."

This month was remarkable for its exceptionally heavy rainfall. The total for the month was 7·64 inches, which is in excess of any previous month during the past 11 years, the nearest approach to it being in October, 1865, when 7·25 inches fell. The following is the rainfall for October from 1865 to 1875:—

1865	7·25 in.	1871	1·88 in.
1866	1·74	1872	5·66
1867	3·48	1873	2·63
1868	2·74	1874	4·89
1869	2·01	1875	7·64
1870	4·56		

This remarkably large amount was made up by several very heavy falls, the principal ones being 1·32 in. on the 9th, 1·11 on the 19th, 1·04 in. on the 22nd, 0·80 in. on the 2nd, 0·62 in. on the 18th, and 0·52 in. on the 26th. A thunderstorm occurred on the 19th. The mean temperature, 48°1, was about the average, but owing to the very cloudy state of the sky the day temperatures were low and the night temperatures high. The mean daily range was only 11°7, which is more than 8°5 less than the mean for the past 10 years. The maximum temperature, 67°6, occurred on the 5th, and the minimum, 31°9, on the 12th. The general direction of the wind from the 1st to the 12th was W. to S.W., and from the 13th E. to S.E. Atmospheric pressure was low and unsteady; the mean was only 29·800 in., the highest on the 6th being 30·513 in., and the lowest on the 13th 29·205 in.

NOVEMBER.

"November, take flail,
Let ships no more sail."

The early part of this month will long be remembered for its storms and floods. The rain fell heavily almost daily from the 1st to the 19th, the total amount for this period being 4·30 inches; falls exceeding half-an-inch occurred on four days, the greatest being 0·79 in. on the 13th. The changes in atmospheric pressure during this interval were also very great, ranging from 30·256 in. on the 15th to 28·736 in. on the 11th: pressure during the latter part of the month was high and steady. The mean for the whole of November was 29·842 inches. Temperature was high from the 1st to the 19th, the mean being 46 3; the wind during this period was chiefly from the W., but on the 20th it changed to N., and continued to blow from N. to E. for the remainder of the month. The weather from the 20th to the 30th was very dry and cold, the mean temperature being only 35°0, or more than 11° colder than the former part of the month. The mean temperature for November was 42°0; the maximum, 59°4, took place on the 4th, and the minimum, 25°8, on the 26th.

DECEMBER.

"St. Thomas grey, St. Thomas grey,
The longest night and shortest day."

The cold weather which set in during the latter part of November continued up to the 10th of December. The mean of the maxima from the 1st to the 10th was only 34°3, and the mean of the minima 25°5. The maximum of several days was scarcely above the freezing point, and the minimum on the 5th and 6th fell to 20°0 and 19°0 respectively. The wind during this period was generally from the N.E. Snow fell on the 2nd, 3rd, and 7th. The wind having changed to the W. by the 11th, the weather from that date to the end of the month was mild, especially from the 17th. The mean of the maxima from the 17th to the 31st was 48°1, and the mean of the minima 39°8; the day temperature on three occasions was above 50°, while that of the night was never below 37°5. The mean temperature of the month was 38°0, the maximum on the 22nd 52°9, and the minimum on the 6th 19°0. Rain or snow fell on 16 days, amounting to 1·31 in. Atmospheric pressure was high, especially during the last week; the mean for the month was 30·148 in.

TWENTY-THIRD HALF-YEARLY

REPORT

OF THE

MARLBOROUGH COLLEGE

Natural History Society,

(FOUNDED APRIL 9th, 1864,)

FOR THE

HALF-YEAR,

ENDING MIDSUMMER, 1876.

"Tum mihi Naturæ libeat perdiscere mores:
Quis Deus hanc mundi temperet arte domum."

MARLBOROUGH
PRINTED BY PERKINS AND SON, "TIMES" OFFICE,
1876.

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STONEHENGE.

Drawn from Nature by F. E Hulme. F. L. S., F. S. A.

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PREFACE.

BEFORE referring to the present Report, the Committee wish to express their thanks to Mr. W. G. SMITH for his kindness in writing a description of the coloured Plate in the last Report. The M.S. only arrived at the last moment, and they unfortunately omitted to thank the author for his kindness as they should have done.

The Coloured Plate to the present Report has again been kindly furnished by F. E. HULME, Esq., F.L.S., F.S.A., who has thus shown his undiminished interest in the welfare of the Society.

The alteration of style of meetings to what it was in the earlier days of the Society, has worked fairly well so far. The attendance at the last meeting was worse than it has ever been, and though this may be accounted for from the fact of no notice of meeting being put on the School notice board, yet as every member is furnished with a printed list of meetings to be held, it would hardly be a sufficient excuse for this obvious want of interest in the Society.

The first Term, being the one in which most practical work is expected, has hardly proved as successful as could be wished. The Ornithological notices have not been so numerous as usual, the Entomological have been very few (mainly owing to the non-existence of the Section), and the Botanical, though fully up to the mark, have been produced by the work of compara-

tively very few, the principal being MILNER and THATCHER among members of the School, and Messrs. THOMPSON, MACDONALD, and DE LISLE among the Masters. The Physical Section has not been as energetic as usual.

In the Museum, but little has been done: the principal object of attention being the Library, which is now in a very fair condition, as it numbers about 300 volumes. The Committee would have liked to have seen more interest in Periodicals. Only one, the "Zoologist," has been mentioned; the others will be taken in again as soon as ever a demand for doing so occurs.

An attempt has been made to make the present Report of more general interest. In addition to the Papers read at the meetings, a few pages of "Notes," selected from all sources have been added. In this way new facts and discoveries will be brought before the attention of members of the School, and a more general interest in the different branches of Science may possibly be awakened. It is, at best, only a first attempt, and if its success should warrant it, the Committee propose to continue and expand this part of the Report.

The Tables of Weights and Measurement of the School, kindly supplied by Dr. FERGUS, will become more and more interesting and valuable in a scientific point of view, as it will furnish a reliable basis for future deductions. A mere solitary table of Weights and Measures will be of comparatively little use, but when continued from year to year, as it is proposed to do, it will become of real scientific value, and with that object it is continued, not as was suggested by the *Marlburian* as a means of increasing the sale of the Report.

The Meteorological Tables and Charts will also be continued regularly, if possible, and arrangements have been made by which this will not be such a source of heavy expense as formerly. The Committee beg to point out to members of the Society that these Tables, taken in connection with the full list of notices of Birds, Insects and Plants, will become more and more valuable every year, and will for the minuteness of the details form a feature

in the Reports which has never yet been attained by any Scientific Society or Periodical, and is one of which the Society may justly feel proud.

The Committee in conclusion beg to offer their thanks to all those who have kindly aided the Society by donations, or showing an interest in its affairs and prosperity. A full list of Donations is given, and it will be needless, therefore, to make further mention of them.

LIST OF MEMBERS.

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R. Armitage.

Treasurer:
J. B. Kite.

Librarian:
D. H. Davies.

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W. M. H. Milner.	G. P. V. Hume.	G. Hastings.
T. G. Balfour.	C. W. B. Jones.	T. G. Brown.
N. Manders.	G. M. Lawford.	W. M. Richards.
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C. E. Blackett-Ord.	G. R. Rogers.	E. G. Waddilove.
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D. H. Davies.	F. P. Lefroy.	P. Barlow.
J. H. C. Dalton.	W. T. Trevenen.	A. Whealler.
S. B. Pemberton.	T. H. Clark.	H. Westcott.

Easter Term:

H. W. Thatcher.	M. Rogers.	L. J. Richardson.
W. M. H. Milner.	T. A. Goddard.	J. Gibson.
T. G. Balfour.	F. P. Lefroy.	W. H. M. D'Urban.
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G. M. Lawford.	A. Whealler.	P. H. Bryant.
G. R. Rogers.	H. Westcott.	

RULES.

1.—That this Society be called the Marlborough College Natural History Society.

Constitution.

2.—That the Society consist of Members, Honorary Members, and Associates.

Officers.

3.—That the Officers of the Society consist of a President, Secretary, Treasurer, Librarian, and Curator.

Election of Officers.

4.—That the President have the absolute power of nominating the Secretary.

5.—That those Members of the Committee, who are not ex-officio Members, be elected terminally, and that the retiring Members be eligible for re-election.

6.—That the same rule apply to the Treasurer, Librarian, and Curator.

7.—That each candidate for election give in his name to the President, any time before the day of election.

8.—That all canvassing for votes by a Candidate, or by his friends with his knowledge, shall at once disqualify him for any election that term.

9.—That any Member canvassing for votes for a Candidate, or for a new rule, forfeit the right to vote on any occasion during that term.

10.—That the election of officers of the Society take place near the end of the term, but that they do not come into office till the beginning of the next term.

11.—That on the occurrence of any election, each Member of the Committee have double the number of votes of any other member of the Society.

12.—That in the event of a vacany occurring in the Committee or any other office to which Members are elected at the beginning of each term, the vacancy be filled up by the Committee.

13.—That eight Honorary Members have the power of debarring a candidate from standing for any office.

Management.

14.—That the affairs of the Society be conducted by a Committee, consisting of the President, Secretary, Treasurer, and three other Members of the Society, to be elected from and by Members of the Society; three of whom shall form a quorum.

President.

15.—That in case of an equality of votes, the President shall have a double or casting vote.

16.—That in the absence of the President, the Committee be empowered to request any Member of the Society to take the chair.

Secretary.

17.—That the duties of the Secretary be to keep a list of all the Members of the Society, and of all former members and Benefactors who may wish to receive the Reports of the Society; to summon meetings (when necessary) of the Society; to keep a detailed report of the proceedings, as well as lists of Members and Visitors present at each meeting, and generally to act under the direction of the Committee in all matters connected with the welfare of the Society.

18.—That in the absence of the Secretary from any meeting of the Society, minutes of the proceedings be taken by a Member of the Committee, appointed by the President.

Librarian.

19.—That the duties of the Librarian be to keep a catalogue of the Library, with the names of the Donors, and to see that the Library Regulations are carried into effect.

Curator.

20.—That the Curator be responsible for the order of the Museum and when necessary assist the Secretary in the distribution of the Reports of the Society.

Library.

21.—That any Member of the Society be at liberty to consult any of the books belonging to the Society, but that only certain volumes, to be decided on by the Committee, be allowed to be taken from the room.

22.—That if any member wishes to take a volume from the museum, he shall give his name, and the name of the book, to the Librarian, who shall enter them in the book kept for the purpose.

23.—That every volume so taken out be returned by the end of the term, but that no book be kept more than one month.

24.—That if any volume be damaged, such damage shall be reported by the Librarian to the Committee, who shall decide upon any furthur proceeding in the matter.

Museum.

25.—That any member of the School, who is not a member of the Society, be allowed access to the Museum at such times as it is open to Members of the Society generally, provided he first obtain leave from the President, which leave shall be renewed every term, but may be taken away at any time, if the privileges be abused in any manner.

26.—That members of the Society be permitted to use the Museum at such hours as the Committee shall appoint; but that in the afternoon it be used exclusively for the purposes of Natural History.

Botanical Garden.

27.—That the Garden be under complete control of the President, or of some person appointed by the President.

28.—That the Garden be open to Members of the Society at all times, and that each Member be allowed to introduce one visitor.

29.—That any Member on application to the President can have the charge of a bed.

30.—That no plants be put in without special leave from the President.

31.—That Members may keep any plants of their own in such places as the President shall appoint as long as the ground is not required.

32.—That the Society's flowers may not be picked.

33.—That Members may gather from their own plants but may not depute others to do so.

Field Days.

34.—That the Field Days be confined *entirely* to Members of the Society, and that the President appoint a day on which names must be given in.

35.—That any member, who has given in his name, must pay his share of the expenses, unless he is *unavoidably* prevented from going, in which case he must give notice at least three hours before the time of starting.

Members.

36.—That the election of new members rest entirely with the Committee.

37.—That every Member pay a terminal subscription of 2s., to be paid at the first meeting of the Society in that term.

38.—That if a member be elected after the commencement of the term, the amount of his subscription for that term shall be settled by the Committee.

39.—That Members have the right to be present, to state their opinions, and to vote at all general meetings of the Society; to introduce two visitors at all general meetings of the Society.; to have personal access to the Museum, and to introduce a visitor at such times, as shall seem fit to the Committee.

40.—That members be considered as Probationary Members for the first term after their election.

Honorary Members.

41.—That Honary Members have all the privileges of Members, except the power of introducing a Member of the School to the meetings of the Society.

42.—That Honorary Members pay 5s. a half-year, for which they shall be entitled to a copy of the Report,

43.—That Honorary Members may compound for all future subscriptions by the payment of a sum of two guineas.

Associates.

44.—That Associates be confined to members of VIth and Upper Vth Forms; that they pay 1s. a term, and be entitled to the use of the Museum, and to attend the meetings of the Society whenever they think fit, but shall not be entitled to vote on any question, to introduce a visitor, or to take books out of the Museum.

Visitors.

45.—That on such occasions when the number of those who wish to be present as visitors at the general meetings of the Society is greater than the number of Members who attend, the President and Committee shall be empowered to admit three or more each, as shall seem fit.

Suspension of Members.

46.—That any Member be liable to be excluded from the Society by the Committee, if, in their opinion, he shall have failed to show sufficient energy in the working of the Society.

Sections.

47.—That the Society consists of sections to be formed for the more accurate study of the different branches of Natural History, and that every Member must belong to a Section.

48.—That the question of the number of Sections be left open for settlement at the beginning of each term.

49.—That on one may leave one Section for another during the term.

50.—That there shall be a definite number of Meetings of each Section during each Term, the number and days of meeting to be settled at a general meeting of the Society, to be held for that purpose at the beginning of each Term.

51.—That attendance of all members (except those of the VI. Form) be compulsory at all the meetings of any Section to which they belong.

52.—That the Sectional meetings be open to any other members of the Society; or of the School, on application to the Heads of the Sections.

53.—That the internal control of the proceedings at each Sectional meeting be entirely in the hands of the Head of that Section.

54.—That the Heads of Sections be appointed for each Term by the Committee.

Meetings.

55.—That there be two general Meetings of the Society each Term, exclusive of the general preliminary meeting.

New Rules.

56.—That any Member of the Society have power to propose any new rule or any alteration in an old one, provided the motion be seconded by another Member.

LENT TERM, 1876.

GENERAL MEETING, FEBRUARY 2nd, 1876.

THE following arrangements were made :—

Botanical Section.—Feb. 8, 22, March 7, 21, April 4.

Ornithological Section.—Feb. 15, 29, March 14, 28, April 11.

Physical Section.—Feb. 18, March 17, April 7.

General Meeting.—March 9.

Also a Second Class for Botany, to be held every Tuesday from 5.30 to 6.30 p.m.

W. H. Macdonald, Esq., also agreed to take a class in Geology, at times to be fixed by the Class.

GENERAL MEETING, MARCH 9th, 1876.

W. FERGUS, ESQ., M.D., gave a lecture on Carbon, illustrated by numerous experiments.

There were 75 persons present.

MIDSUMMER TERM, 1876.

The following arrangements, decided upon by the Committee, were explained, and though some members were inclined to object to them, their objections were over-ruled, and the resolutions of the Committee were ultimately unanimously agreed to.

(1). That the General Meetings be held fortnightly.

(2). That attendance at Sectional Meetings be voluntary, but that members must attend two out of the four meetings to be held every Term.

(3). That the meetings be held in the Museum, and that a short paper be read, followed by exhibitions ; and discussions be resumed as in former times.

(4). When a certain number of members can be found to form a Section, that Section to be considered as in existence.

(5). That endeavours be made to make the Report more acceptable to members of the School.

(6). That those who do not attend the preliminary meeting be considered as wishing to retire from the Society, and their names will consequently be erased from the List of Members, unless satisfactory reasons for absence be given.

The following arrangements were made:—

Botanical Section.—Thursdays, May 11, 25, June 8, 22.

Ornithological Section.—Thursdays, May 18, June 1, 15, 29.

General Meetings.—Tuesdays, May 23, June 6, 20, July 4.

Field Day.—Saturday, May 20.

The following absentees, who gave no sufficient reason for their absence, were no longer considered as members of the Society:—

S. B. Pemberton.
W. G. O. Cooper.
O. Ellis.
E. J. Reeves.
F. W. L. Birdwood.
W. T. Trevenen.
W. Pemberton.

FIELD DAY, MAY 20th, 1876.

This was held at Bedwyn; the lateness of the season prevented any very great amount of work being done; the Lists of Notices were very small, and no discoveries of any importance were made.

MEETING HELD MAY 23rd, 1876.

The President gave a short account of the Theory of Natural Selection, as worked out by Dr. Darwin, and mentioned a few of the Objections to the Theory.

After explaining how plants and animals may be arranged, more or less completely, in a series from the very lowest forms up to the most highly organised, and that when we come to the border-line between the animal and vegetable creation, we even meet with forms about which naturalists are uncertain as to whether they are animal or vegetable, it was shown that by Darwin's Theory every species now existing was descended from some simpler form, and that thus we come to the conclusion that all species now existing have descended from a few, perhaps one primary form of the very simplest structure.*

* In what follows I must apologise for the frequent use of the first person: but I merely wish to state my own opinions on the subject, and should be very glad to have them answered by those who dissent from them.

This Theory is founded upon the fact that the descendants of every individual vary more or less, and by a careful study of the manner in which plants and animals vary, he has drawn up certain "laws," and has collected a vast amount of facts in support of his Theory. Such a careful observer as Darwin is too candid to attempt to distort any *fact* which he records, and we may safely take for granted that whatever he states to be the case is so, at least as far as human accuracy can go, but it is in the *interpretation* of those facts that naturalists differ. The battle must be fought out on its own ground, and religion must be put aside, but I cannot pass over the fact that Darwin himself (whatever others may think) denies the fact of a guiding Providence, he states that where any *accidental* variation occurs for the benefit of the Individual, that variation will be perpetuated in his progeny, and will ultimately, by a series of accumulations, develop into some perfect limb or sense. Teleologists, who deny "*the chance*," cannot of course assent to this. If this evolution were proved to be correct, they would still hold that all has been done by a Divine Omniscient Being, and certainly it seems needless to insist on this *accidental* variation, were it not that it has thereby led some even to deny the existence of a God.*

But, as I said before, this must be put aside, and the Theory must be considered on its own merits, and before entering into the more particular "laws," drawn up by Dr. Hooker, to which I shall presently allude, it seems to me that, on the general consideration of the Theory, the following objections suggest themselves:—

(1). An advantageous variation being caused by an alteration of circumstances, or at all events a variation becoming advantageous from surrounding circumstances, it follows that nothing is suited to its conditions in nature. As fast as any "advantage" has been caused by accidental variation, the surroundings have been altered, and thus we never find a plant or animal exactly suited to the conditions in which it is placed. This, I need hardly say, is totally denied by Teleologists.

(2). When a limb is altering from one form to another, as for instance, the "hand" of the monkey to that of man, the two extremes are admirably suited for the purposes required by a monkey and a man respectively, but the intermediate states will be disadvantageous to both, and thus we shall come to a vast number of animals in which a limb, in its transition state, is anything but useful.

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* Since writing this, it has been suggested to me that the word *accidental* may have another meaning attached to it than that assumed here, viz., *resulting from external circumstances*: but were this so, I think some further explanation ought to have been given, as it is certainly the *usual* meaning of the word.

(3). We get certain links, it is true, between two distinct forms, but in many cases we get enormous gaps. The answer to this is that we do not know enough yet; the geological record, as yet known, is very imperfect, but additional proofs may be supplied as we become better acquainted with vast tracts of land as yet unexamined. To this I think it may be fairly answered that if the evolution of one species from another is as slow as Darwin requires, we must necessarily have a vast number of links, and little as we may yet know of geology, we ought to have an enormous number more of those "links" than we actually have. There is scarcely a single animal whose ancestors have been so traced by evolutionists, and even then we want a large number of connecting forms.

(4). If the number of species is increasing so rapidly, and if all these have descended from one or a few primary forms, we ought to meet with fewer forms of animal life as we search the older strata of the earth. This seems to be very far from the case. The number of mollusca for instance, seems to have been quite as numerous in earlier times as now. I am quite aware that it may be replied that these forms have, many of them, died out, and thus the balance of numbers may be kept up, but still the number of species ought to be far fewer as we recede to the earlier ages of the world.

(5). When we meet with any particular form, as for instance, an Ichthyosaurus, we ought to find a series of forms in older strata becoming more and more perfect as we approach the stratum in which the animal appears. So far from this being the case, we find when we first meet with an Ichthyosaurus that it is perfect, that there is not anything like a series of rudimentary forms, and this we ought certainly to meet with, if the animal has been developed from pre-existing forms.

(6). But, perhaps, to my mind, the most weighty argument against the Theory is that limbs can be *developed* by Natural Selection. It is generally agreed that limbs can *degenerate* by disuse, but there does not appear to me to be any ground for the belief that the reverse can take place. Evolutionists, I am perfectly aware, lay great stress on the fact of "rudimentary organs" being unaccounted for on any other hypothesis, and it only proves how very differently the same fact may impress different individuals. Teleologists believe that there is one grand plan, and it is their delight to trace how admirably that one plan is varied to suit the different creatures in their several conditions of life: and a rudimentary organ, to them, is but a proof of that unity of design so wonderfully displayed in the works of creation. Thus, those animals which are blind are so because, living in the dark, their eyes were useless, and consequently by disuse they have ceased to have any. On the other hand, it is to me inconceivable how a rudimentary organ (at all events in its first stages) can possibly be of any *use* to the creature: in my

opinion it would rather be a disadvantage, because until it has become so developed as to be made use of, it surely must be very much "in the way" and act as a hindrance. These rudimentary organs seem to me to be but the natural result of disuse or of non-use, and consequently in my opinion tell greatly against evolutionism.

(7). Perhaps here may be mentioned also another argument to which great weight is attached by evolutionists, but which like the former seems to me to tell the reverse way, and that is embryology. There is a general agreement among those who have studied the subject, that in its earliest stages man (for instance) is undistinguishable even from plants; as he grows he passes through various stages, each successive stage more and more determining *what* he is, but only till a late period before birth are we able to tell that he is *man*—he may be fish, reptile, bird, dog, anything for what we can tell, and hence, say evolutionists, this is a proof that man has descended from these various forms of nature, and this is a proof of man's descent. To me, this successive change cannot be otherwise. The grand unity displayed in creation would *necessarily* require that there should be this indefiniteness in the earlier stages of man's life, and that therefore this argument for evolutionism falls to the ground. Besides as Dr. Bree has very pertinently remarked, this successive development is not so very "indefinite," if I may use the term. To take the nervous system, for instance, he says "There is a real and significant difference in the embryo of man, as compared with brutes, from the earliest period of its structural existence," and he points out how this is the case. Besides it is all very well to say that we cannot tell the embryo of one animal from that of another in its earlier stages, but that is no proof that there *is* no difference. Our knowledge may not be sufficient as yet, and as it is impossible for an uneducated person to tell a piece of quartz from a diamond, though perfectly easy for one who has had experience in these matters, so it is quite within the bounds of possibility—nay it is but natural —that we should not be able to discriminate between two different embryos.

Such are some of the objections to the Theory, as far as they appear so in my opinion. When we deal with the *details*, the objections appear to me to be enormously increased in number and weight. The Theory was at first laughed at because it suggested certain cases which even now appear to me to be ludicrous, but there was a charm in listening to the arguments of evolutionists, because they were given with all sincerity and allowed people to differ from their conclusions: but unfortunately the subject has not been discussed without the introduction of personalities, and much ill-feeling has been thereby aroused. I trust, however, that on the present occasion each one may be allowed to hold his own opinion without being ridiculed by others, and that the discussion will be carried on with that consideration for the

feelings of others which ought always to be the characteristic of debates on scientific subjects.

Now refer to the more detailed arguments. The most simple summary of the theory of the "Origin of Species" which I have met with is given by Dr. Hooker in his "Botany," one of the Science Primers edited by Professor Huxley and others. He says "It regards as proved—(1) That the descendant of every plant departs (varies) more or less in character from its parents. (2) That of these variations some are better fitted than others, and even sometimes than their parent was, to survive in the area the plant inhabits. (3) That the conditions of the area are, like the individuals, variable. (4) That the number of deaths previous to maturity amongst the descendants is enormously greater than that of survivors, and that these deaths are due to the conditions of the area not having suited them. (5) That the descendants (variations) best fitted to thrive under the conditions of the area will be the survivors. (6) That these variations will hence ultimately in certain places supplant the parent form. (7) That the difference between a species and a variety being one of degree only, the variations accumulated through successive generations will become specific, and these again by a like process generic, and so on.

Now this is all very well as far as it goes, but it presupposes a variety of circumstances which I believe to be very far from the fact. To take the first of these: no doubt variation does exist, and that if you take any two plants of the same species, you will find many points of difference between the two, just as you cannot find two persons, even twins, exactly alike—but Teleologists believe that there is a limit to this variation, otherwise how could we possibly classify plants or animals. If variation were to go on so extensively as here suggested, we should have every created thing very different from its neighbours. I think, also, that the origin of species, under this plan, would be accomplished far more speedily than at present. It may be observed that Darwin at least denies the possibility of a variation *back* to the original form. No doubt *some* Evolutionists may believe this to be the case, but the following passage from Mr. Watson's Supplement to the Cybele Britannica will confirm the above statement: "I have communicated to the thoughtful and candid author of the Theory a suspicion that he ought to have allowed for more influence and effect to a gradual convergence of characters, still in onward progress, acting jointly with and in some measure counter-acting the gradual divergence of characters; the two tending to keep up an approximate equilibrium in nature, in respect to the number of species and genera, their mutual affinities, &c. This would not interfere with the operation of his rule of "natural selection," the grandly distinctive feature of his theory. But he appears indisposed to believe this idea sound, or as being anywise necessary

to save his own views from something very like a logical *reductio ad absurdum* —one species to begin with, millions to end with."

Some genera seem to be more liable to variation than others—take for instance the Rose and the Bramble. Both these are similar in structure in many ways; they are classed very near each other, and the variations of each are astonishingly great, botanists being very undecided as to the actual number of species. But with all this, anyone with the smallest amount of observation could not confuse a rose with a bramble. If these variations were so incessantly increasing, there would surely be a sufficient number of links to connect the two. The fact is that Teleologists do not deny variation, but assert that variation is confined within certain limits.

The second "law" enunciated by Dr. Hooker I cannot assent to in its fulness. Of course if there are a great number of specimens, each differing from the other, there would be some "better fitted" to survive than others, but taken in connection with with his third "law," it will account for the variation. As the conditions of the surrounding circumstances vary, so may the plant itself vary, *within certain limits*, to suit those conditions: but I do not think we have any right to consider their variability as capable of any amount of extension. Another very important point must be kept in view, though opinions may differ on the subject. So much has been said about the "struggle for existence" by which the "survival of the fittest" is brought forward as a reason for incessant variation that Evolutionists may not be prepared to assent that the *tendency* of plants and animals is towards *degradation* rather than *improvement*: but I believe that this is really the direction in which plants or animals, if left to themselves, would really tend, and consequently the "struggle for existence" is but a necessary law to *keep up* the proper state of existence of created things. Where the "vermin," as they are called, are destroyed by gamekeepers, the game is believed to deteriorate, as the weaker ones are able to live and thus give rise to a weak progeny, and the great losses in grouse, &c., are attributed to this circumstance. Whether this be really the case or not, I do not profess to judge, but in my own opinion it is very *possible*, and is certainly more reasonable than the development of one species into another.

Laws 4 and 5 can only be true provided nothing interferes, but as I fully believe that "as no man liveth to himself," so no plant or animal lives for itself always, but that every created thing is formed for the benefit of others, and hence to say that "these deaths are due to the conditions of the area not having suited them" will not be true—on the contrary there would be every reason to suppose that the most vigorous would *probably* be the first to be destroyed for the benefit of others. Besides, I believe that *man's* benefit and pleasure are largely provided for by God, and that an arrangement whereby

man's *pleasure* even may be enhanced might be selected in preference to another more advantageous to the plant or animal; this is, of course, a matter of *opinion*, but it is one which weighs much with me, and is quite as deserving of consideration as some of those interpretations and explanations of a fact brought forward by Evolutionists.

Of No. 6 I don't see the force, especially when taken in connection with the previous remarks.

Finally No. 7 is a surprise to me, especially when we really do not know what a *species* is. To take one case, *Habenaria bifolia* and *chlorantha*, two species of Orchids united by Bentham and others, because similar to one another in many points, but which Darwin himself has shown to be very widely separated. If then we find two plants apparently similar at a cursory glance and yet very widely separated, how can we say that the difference between a species and a variety "is one of degree only." Teleologists believe in species, and though we cannot yet always decide which is a species and which a variety, it is because we have not yet been able to work out the *constitution*, if I may so say, of the specimens. We certainly know that, as far as we have yet been able to judge, species are distinct, and though we may *cross* them, yet the progeny after a few generations return to the forms of their parents. *Why* this is so we cannot tell, but there must be some reason, which reason we have yet been unable to discover, and we cannot therefore clench the matter by saying it is one "of degree only."

Such are a few of the arguments which to my mind bear against the theory of evolution, but Dr. Bree has published a work "on the Fallacies of Darwinism," which deals more in detail with the subject, and which, I wish to commend to the notice of all who are interested in it, as in fact, were I to take up each particular point, I fear I should weary you. I shall therefore merely conclude with a few remarks upon Dr. Hooker's introduction of the subject in his "Botany" referred to above. Talking of independent creation and of evolution he says "The first doctrine is purely speculative, incapable from its very nature of proof; teaching nothing, and suggesting nothing, it is the despair of investigators and inquiring minds. The other, whether true wholly or in part only, is gaining adherents rapidly, because most of the phenomena of plant-life may be explained by it; because it has taught much that has been indisputably proved; because it has suggested a multitude of prolific inquiries, and because it has directed many investigators to the discovery of new facts in all departments of Botany." Speaking for myself only, I can safely assert that no fact which evolutionists have brought forward as proof of their theory has convinced me in any degree and *many* which have been so brought forward have had the very opposite effect on my mind. The great delight and pleasure of Teleologists have been to trace the hand of a Divine Ruler in every-

thing, to see how admirably everything has been fitted for its proper sphere, and therefore as for "its teaching nothing, suggesting nothing" and being the "despair of investigators and inquiring minds" it has been anything but that to them. As for the reasons given for evolutionism, any theory, provided it is at all reasonable will necessarily call forth argument and observation, and so far does good, as it directs attention to facts not generally noticed. Dr. Darwin has done much good this way, and his laws about variation have been of service in enabling us to understand facts, but in my own judgment, those laws hold just as truly for Teleology as for Evolutionism, and I prefer to take them and treat them as proofs of a Divine Originator, of the perfection of the whole of creation, and of the wonderful manner in which every being lives, not only for itself, but for others.

T. O. HARDING, ESQ., stated that the objection as regards the time required by Evolutionists in comparison with that during which the earth had existed (which had been mentioned in the Account, though under reserve) was untenable, the duration of the earth being variously estimated to be from 23 to 600 millions of years. He also stated that in his opinion it was quite possible we were developing into something better (what it was, we know not) and hence the Theory of Evolution was not so absurd as it might seem to some people.

F. E. HULME, ESQ., also alluded to the drawings of animals on the oldest buildings of antiquity, in which, ancient as they were, the same forms were preserved exactly as at the present day, showing no change during all that time.

DR. FERGUS also made some remarks more especially in reference to that part of the Theory which considers all variation to take place by chance.

The President passed round some Maté or Paraguay tea, which was tasted by many persons. It appears not to have been so much appreciated as in S. America.

Also some Hygrometric Plants: (1) a *Selaginella* from Chili; (2) a Rose of Jericho (*H. Anastatica*), presented by G. F. Rodwell, Esq.; and (3) a small plant from Africa which had been presented by Rev. C. Coldwell.

The Rev. A. G. Bleeck exhibited a very fine specimen of the Gigantic Morel (*Moschella crassipes*), weighing 13 ounces and measuring 16¾ inches in circumference, which he had gathered in his garden. Also a specimen of the Welsh Poppy (*P. hybridum*) naturalised in his garden.

C. E. Blackett-Ord exhibited a Half-crown (gun money) of James II. and a Siege Piece (Newark) of Charles I.

R. Armitage exhibited a bronze Siamese Idol.

G. Fowler exhibited a collection of fossils from Brora in Sutherlandshire, which he afterwards presented to the Society.

There were 38 persons present (17 members and 21 visitors), including Rev. A. G. Bleeck, F. E. Hulme, Esq., and T. O. Harding, Esq.

MEETING HELD JUNE 6TH, 1876.

C. E. BLACKETT-ORD read the following paper on

STONEHENGE.

"DRUIDICAL monuments," we are informed by a celebrated antiquary, "consist of Obelisks, being large stones or pillars set up perpendicularly, Carnes or Carnedes (hence Cairns or stones of all dimensions in a conical form) Cromlechs, stones not closed up at the end and sides, Kistvaens or chests formed of four stones, Rocking Stones, Dolmen or stones of passage, Rock Basins, and circles or ovals such as those at Abury," and, we may add, Stonehenge. Stonehenge, though it is the most visited and the best known to most people, is certainly the latest of the two, for its hewn uprights and imposts shew a much more advanced stage of architecture than the simple stones which compose the temple at Avebury. As we are promised a paper on Avebury, I will only speak to-night of Stonehenge, and the shortness of the time at our disposal makes it impossible, I am afraid, to speak of anything but the actual Temple itself; the numerous barrows that surround Stonehenge, the cursus to the north of it, and the avenues leading to the Temple, as well as the Roman camp near it, I must leave to your own researches. It will be well worth anyone's while to look through Hoare's Ancient Wiltshire, if it is only for the sake of the engravings; they are very good, and to us principally interesting because they include maps of every place interesting archæologically in the county; even the places we know best are put in a new light, and as one reads it one finds new Antiquities crop up in the most unexpected and familiar places, quite near Marlborough. For Stonehenge itself, Stukely of course is the best authority; he is rather dry, and very learned, but he enlivens his masses of facts and measurements with small bursts of eloquence here and there, when a particular fit of admiration seizes him, and his most elaborate arguments are made almost interesting by the delightfully simple credulity in which he makes astounding assertions, and by his old-fashioned style, which in places becomes intensely ludicrous; but it must be said he is very sensible all through, and very painstaking.

Most people have very vague notions about Stonehenge; they think of it as a collection of great stones on Salisbury plain, that was once a temple;

the 'ancient Britons' built it, and the Druids sacrificed in it, and so on. Well, all this may be quite true, but the popular notions of the ancient Britons and their temples and their Druids are very vague; in fact, the best informed archæologists are quite at variance as to who were the founders of Stonehenge, and on many other points connected with it; in fact, its interest comes in no small degree from the fact that it is entirely prehistoric, so that we can only conjecture about it from what we know of the earliest people who lived in Britain.

Before we consider who built Stonehenge, we must see what it is like itself: in its perfect state it consisted of two circles one inside the other, enclosing two imperfect ovals, in shape something like a horseshoe, with the opening turned to the entrance of the temple, which faced the North-East; this fact of the temple facing north-east we shall have to consider further on; in the meantime, to begin at the beginning, the outer circle consists of 30 upright stones with 30 horizontal ones laid on the top, the height of the whole being about 15 or 16 feet. The stones are two yards, roughly, by one, the spaces between them squares of one yard, so that the stones cover twice the area of the spaces between them; this is the fundamental difference between Stonehenge and a colonnade, for in a colonnade the spaces are larger than the pillars: the length of two stones + the space between = the height of one stone with its cornice-stone: the stones are dressed above-ground, but the base which is planted in the chalk is left almost in its natural state, the inside face being the most carefully dressed, and the best stones being placed towards the front of the Temple, the entrance facing North-east. I must tell you Stukely has shown with great probability that the measure used in the construction of this as of many other ancient works, was the cubit of 20 inches, the length of the hand and forearm, the most natural and primitive measure, equivalent to about five hands-breadths.

Well then, having considered the way in which the big grey stones that formed the uprights are shaped and placed, we come to the cross-pieces, or as Stukely calls them, imposts. These are morticed on to the two uprights by a very simple and natural, but at the same time effectual system of geometry: the top of each stone as we saw, is twice as long as it is broad: thus its area is divisible into two squares: in the middle of each of these two squares is an excrescence shaped like half an egg cut across; these correspond to mortices of the same shape in the cornice-stone whose end is to rest on that square: for the horizontals meet on the tops of the uprights, not above the spaces between them, which would weaken the structure considerably; as the upper surface of the upright stones is divisible into two squares, so the under surface of the horizontals is divisible into three; the middle one of these is not supported by anything, it hangs in mid-air, so to speak, over the space between

the two uprights; the two outer squares rest one on each of the uprights, half the area of whose tops they cover, fitting the tenons made there to receive them. These cornice-stones project slightly all round; they are rounded on the outside to suit the curve of the circle, but straight inside, which gives the interior a polygonal form. The entrance to this, which faces north-east, it a little wider than the other spaces between two uprights; this is effected by putting the two uprights, which we may perhaps call door-posts, a little farther apart, thus making the two spaces next them on either side a little narrower than the others. The lintel-stone of this entrance, in like manner, to prevent its being broken through its greater length, is thicker than the others; but the thickness is only increased below, so as to make the height of the entrance rather less than that of the other spaces; if it were thicker above, the stone would project above the others, which would spoil the regularity of the circle.

After all these dry details I must not bore you by describing the inner circle so elaborately: it consists of 40 stones, half the dimensions every way of the uprights of the outer circle, not corresponding exactly, which procdues a natural variety, the Druids' style of architecture being by no means stiff or over-regular.

Next we come to the cell, the most sacred part of the Temple: of course, it is a common custom to look on a small inner part of a temple as peculiarly sacred; the Tabernacle and the Temple of Jerusalem, and all ancient Greek and Roman temples had this feature, and even now we adorn the east end of our churches more elaborately than the other parts. Stonehenge is no exception to this rule: its cell when it was perfect consisted of five trilithons, the middle one facing you as you entered, the others, two on each side, so that the whole is in the shape of a horseshoe, or rather of about three-quarters of a perfect oval. (Those of you who have read Kingsley's Hypatia will remember the Greek notion of the divine properties of the circle; and measurements confirm to a remarkable degree the supposition that Stonehenge is formed on the principle of various combinations of the circle as the most complete figure, besides the fact of its general external shape being circular).

The appearance of the cell was something of this sort: the five large and massive trilithons were not of equal size, but the two on each side of the entrance were the smallest, the next two larger, and the fifth, which stood behind the altar, the largest. There are two peculiarities in the construction of these trilithons: first, the uprights taper to a certain extent, those sides which are in the line of the oval not being straight but convex, so that when you stand in front of one and look through the sort of doorway without a door which it forms, it looks as if the uprights tapered to a certain extent: their thickness, however, though not their face, is uniform; that is to say,

only two of their surfaces narrow towards the top, the other two are rectangular, though slightly convex. This slight variation gives a certain amount of grace to the building, and at the same time shows off the massiveness of the stones. Secondly, the upper area of the large horizontal stones is a little larger than the lower, so that the sides are not perpendicular but slightly overhanging. This shows a considerable amount of knowledge of optics, as its object is to correct an optical illusion; for if the sides were perpendicular, they would, when seen from below, seem to slope away not to be perpendicular.

I may as well notice here an instance of the care and mathematical regularity with which Stonehenge is built. The ends of each of the upright stones of the trilithons stand on radii of the oval which is the shape of the cell, that is to say, those ends if produced (excuse the Euclid) inwards, will meet at the centre of the figure. This a good instance of the thoroughly broad conception formed by the builders of the design of their work. It is also noticeable that the method of morticing the trilithons' uprights to the horizontal is different from that used in the outer circle. In the outer circle the tenons are of the shape of half an egg cut in half, down the middle from end to end, they are in fact half an oval: But in the case of the trilithons the tenons are in shape halves of circles, more like the halves of an egg cut across the middle, less in circumference, but higher: it is rather hard to see the reason for this difference of construction; Stukely says it is to meet the different conditions of exposure, &c., of the inner and outer buildings, but this seems hardly satisfactory, and we must be content to wait for some better solution.

Inside the oval, about a yard from it, there stood a second oval of smaller stones, without horizontals: their dimensions are one third every way of the uprights of the trilithons. They require no notice except that like the inner circle they are of a much harder stone than the rest of the temple, a fact which will have to be mentioned again.

Close in front of the largest trilithon, facing you as you enter, is the altar, a large flat slab of a sort of hard sandstone, capable of resisting fire: the nearest place, I believe, where such stone is found, is the upper Thames valley, but you must be cautious about accepting this statement, as I know very little geology. Digging about this altar, people have found not only wood ashes and the bones of animals used in sacrifices, but in the time of Henry VIII, we find in Camden that a tin tablet was dug up there, with unknown writing on it; of this we shall speak farther on.

We must be content with a very brief notice of the exterior of the temple: it is fenced in with a vallum distant from it about 35 yards or exactly its diameter: on this vallum are two stones and two cavities which possibly

once contained other stones: these either mark the four points of the compass or as Stukely thinks were altars or lavers used for libations and offerings in processions round the outside of the temple. In the entrance of the vallum is another large stone, which has probably always been in a leaning position: this is connected with the Druids' worship of the sun, as it has been proved by observation, that to a person standing at the altar the sun rises on Midsummer-day exactly over this stone.

So much for the form of Stonehenge: now for the materials. The outer circle and the outer oval are of the "grey wethers" from the downs between here and Avebury, whose nature we have not time to consider now: they supplied the material of Avebury also. They were probably transported on sledges moved on rollers, much in the same way as we see represented on some Egyptian monuments. Some people have made a difficulty about the possibility of transporting such large masses: but this vanishes at once when we consider that not only do the largest obelisks and statues of Egypt and Assyria weigh hundreds of tons, while the largest stone of Avebury—larger than any at Stonehenge—only weighs twenty or thirty, but also the grey wethers are already half-hewn by nature, so that the Britons had no quarrying obstacles to overcome. The total number of the stones is 140.

In the short time that remains, we may just in a very few words consider the probable origin and the institutions of the people who built Stonehenge. Stukely has a very fantastic notion about them: he says that they were Phœnician traders who penetrated thus far up the country: that they were of a race with which Abraham had been connected, and that hence they derived the custom of setting up large stones as a temple (which is so common in the Bible) and that their Monotheism like that of the Jews was associated with the notion of a Messiah, which in later days led them readily to embrace Christianity. So far, his notion is completely improbable, for the Tyrians very possibly never came to England at all, but only to Scilly, and if they did, they only established trading posts, as it was directly opposed to the Phœnician custom (except in the notable case of Carthage) to establish political supremacy over the natives, with whom it was their object to be friendly and carry on trade. Besides, the remains of Stonehenge are so like others which we know to be Celtic, and history is so absolutely devoid of any traces of such a Phœnician ascendancy in Britain, that Stukely's Phœnician theory cannot be accepted. But he is perfectly right in saying that the builders of Stonehenge were the earliest Celtic immigrants, the ancestors of the Irish, Scotch, and Bretons. The Celts were the earliest Aryan immigrants into Europe: who were before them we can only guess, but we know that they were followed by the Teutons, who pushed them westward. It seems, then, that the earliest Celts built the outer circle and outer oval

of Stonehenge, and that the smaller upright stones which form the inner circle and inner oval, were brought (probably from Cornwall, as they resemble granite) by the later wave of Celtic migration, who were driven westward by the advance of the Teutons, and whom Cæsar calls Belgæ. These people brought the smaller stones to ornament Stonehenge, already a sacred and ancient place, and they are the ancestors of the Welsh and Cornish. Perhaps you may not know that they made the Wansdyke, which is the northernmost line to which they ever advanced. These Celts called Stonehenge Choir Gaur, or great temple; the Saxons simply named it from its appearance Stonehenge, hanging stones or stone gallows, being struck with the cross-stones which are not found in the more ancient work of Avebury. Roman coins have been found there, and Inigo Jones had a notion (to prove which his son-in-law, one Webb by name, wrote a treatise) that the Romans built it, others have thought that it is Danish.

Everyone knows who the Druids were, but perhaps one or two points about them may interest you. They were not only priests but to a certain extent elders in general of the people, and administered justice probably at great gatherings at the temple like Stonehenge. Their religion was partially sun-worship, as we saw above when we noticed the position of the leaning stone in the entrance to Stonehenge, partly Monotheism, and partly worship of dead ancestors and heroes, as animism or belief in the immortality of the soul, was a very prominent feature in their belief as it was in that of the Etruscans. The tin tablet found in the time of Henry VIII at Stonehenge was probably one of the letters to the dead which, as we find in various authors, were buried with the corpse, just as many nations in all ages have buried food, clothing, slaves, &c., to supply the wants of the dead hero though human sacrifice was probably not frequent among the Britons.

In conclusion, I must thank Mr. Hulme in the name of the Society for his beautiful contribution to the next Report, which the President will exhibit this evening.

The President remarked that from the discovery of the diversion at Silbury of the Roman Road to Bath, that and Stonehenge (which were apparently connected) were in existence before the time of the Romans.

The Rev. A. G. Bleeck mentioned the *cursus* at Stonehenge, which appears to have been an important adjunct, as there is a corresponding cursus near some ancient remains on Dartmoor.

F. E. Hulme, Esq., made some remarks on the ancient Welsh—on the "Druid's Head," (a small Inn),—on the number of the stones, which seems very difficult to calculate, and on the opinion of Inigo Jones, who believed that the Romans built Stonehenge.

The President exhibited some "Gun money," in which the half-crown pieces had been re-stamped and made to pass for crowns. Also some "Pillar Dollars" and "Bank Tokens," the former with the stamp on the neck of the bust to allow of their circulation in England.

Also some "Cumshaw Present Tea," "Cumshaw Bull Tea" and "Brick Tea."

Also a species of rare "Coccus" from a plant (a *Euphorbia*) in his greenhouse. This had been submitted to Professor Westwood, who stated that he had fully described the animal in a previous number of the *Gardener's Chronicle* from specimens living on the leaves of the Camellia. Professor Westwood exhibited specimens at a meeting of the Entomological Society of London, recorded as follows in the *Entomologists' Monthly Magazine* for August:—"He also exhibited a number of specimens of a closely allied species [to *Coccus Camelliæ*], which he had recently received from the Rev. T. A. Preston, of Marlborough College. These specimens were found on the leaves of a *Euphorbia* forwarded to Mr. Preston from Kew, and on them were also found a considerable number of small semi-transparent oval scales, from the posterior extremity of which were protruded two very short white delicate filaments, which the Professor immediately recognised as the extremities of the two caudal setæ of the male *Cocci*, which had not then made their escape from their strange puparium; this they do backwards from beneath the hinder extremity of the scale, a mode of exit of the imago quite unique in the insect world, the wings being thrown, by the backward motion of the male, over its head! He also exhibited a drawing of the male and anatomical details magnified, and proposed the name of *Coccus euphorbiæ* for the species."

E. F. NEWMAN sent for exhibition a nugget of Australian gold.

REV. A. G. BLEECK exhibited specimens of granite, peat, china-clay and lead ore, from Dartmoor, all of which were now becoming important sources of profit to the owners of the land. He afterwards kindly presented the specimens to the Society. There were 39 persons present, including Rev. A. G. Bleeck and F. E. Hulme, Esq.

GENERAL MEETING, JUNE 20TH, 1876.

A. J. BURNESS read a paper on "The Snow Fields and Glaciers of Greenland."

G. F. RODWELL, ESQ., exhibited the spectroscope which had been presented to the Society by W. W. Fowler, Esq., (O.M.)

The President exhibited specimens of Sugar of milk, and of Caseine, a product of the potato. Also the quantity of fat and of sugar obtainable from 1 lb.

of potato; a specimen of a monstrosity of a fuchsia; a bundle of fir leaves felted together by water from a lake in Shropshire; and specimens of the Globe Conferva (*C. ægagrophila*) also from Shropshire.

There were 36 persons present, 2 Honorary Members, 22 Members, and 12 Visitors.

GENERAL MEETING, JULY 4TH, 1876.

This was very poorly attended, only one Hon. Member, three Members, and four Visitors being present, and consequently the proceedings were of a very informal character.

BOTANICAL REPORT.

The "Roll-call" this year has been far more complete than usual, very few plants having escaped observation, and of those few most are very local, and their habitats out of our usual beat. This is the more satisfactory, as the earlier part of the year was most unfavourable to vegetation. Omitting those plants which are in flower all the year, there were only 4 in flower in January, 14 extra in February, 15 in March, 32 in April, 135 in May, 181 in June, 107 in July, and 8 in August (up to the 5th). This caused plants to be far more abundant in June and July than is usually the case. By the end of May there were about 200 species in flower, but on the 5th of July, when we had a regular search, as many as 325 species were gathered, besides a few, very nearly out, and the ordinary cultivated plants which we regularly observe.

But besides this satisfactory "roll-call," we have been able to add no less than 8 new species to our list, besides a considerable number of new localities. These are given below:—

NEW SPECIES.

Diplotaxis muralis—on the Railway Bank, found by M. and T.

Trifolium filiforme—In a grassy lane at the foot of Martinsell.

Callitriche platycarpa—Stype wood, on mud.

Sambucus Ebulus—Little Bedwyn. This was noticed by Mr. Coleman some time ago, but the description he gave of the plant was too indistinct for recognition, and it has consequently remained unrecorded till now.

Carduus tuberosus—This plant has been recorded from Avebury, but has never been discovered since we commenced our records till Miss E. A. Ormerod detected it this year,

Verbascum nigro-thapsus ?—A plant, apparently a hybrid beeween *V. nigrum* and *V. thapsus* was noticed in a hedge between Axford and Ramsbury.

Scutellaria minor—Discovered by E. F. im Thurn, Esq., in Stype Wood.

Chenopodium album var. *candicans*—Found at Ramsbury.

Herminium monorchis—Found in great abundance in Black Burney Bottom by E. F. im Thurn, Esq.

NEW LOCALITIES, and other remarks.

Thalictrum flavum—near Silbury Hill, H.W.T.

Helleborus viridis—Huish, G.H.D.

Reseda lutcola—Stype wood.

Polygala depressa—Bedwyn.

Tilia intermedia ?—The Lime trees were unusually late in coming into flower. The dry weather seemed to cause them to shed their flower buds—when noticed in flower it was evidently too late to be of any real use.

Genista tinctoria—Black Burney Copse, A.B.P.; also Overton Dell, A.B.P.

Trifolium pratense—Several specimens of what must be this species, but with the stalk of the flower head unusually elongated (far longer than in *T. medium*) were found by M. and T.

Vicia sylvatica—Ramsbury woods.

Lythrum Salicaria—Axford Marsh. A single specimen had been found some years before at Ramsbury, but with that exception this species has not been found near Marlborough hitherto.

Epilobium augustifolium—In a hedge near Black Burney Bottom, E. F. im T.

Circœa lutetiana—Woods at the foot of Martinsell, W.M.H.M.

Chrysosplenium oppositifolium—Bedwyn.

Sesen amomum—Stype.

Torilis nodosa—Black Burney Bottom, also on a hedge bank near Mildenhall, E. F. im T.

Conium maculatum—Axford.

Carduus eriophorus—Roadside, Ramsbury Hill. Overton Dell.

Serratula tinctoria—West woods, in the lane leading to Clatford Bottom.

Senecio sylvaticus—Manton Copse, in the part recently cleared.

Senecio erucifolius—Stype, plentiful.

Senecio campestris—Abundant at Avebury this year.

Hieracium vulgatum—Woods below Martinsell, W.M.H.M.; Stype, E. F. im T.

Campanula Trachelium—Ramsbury, E.F.im T.; Overton Dell, E.F.im T.

Monotropa Hypopitys—Ramsbury, A.B.P. The roots of this plant, which have never yet been satisfactorily made out, have been the special study of E.F.im T. At present it appears that in a young state these are distinct, though delicate, fibrous roots, but as the plant gets older, they so increase as to form a dense confused mass.

Gentiana Amarella—Specimens were found in flower by W.H.M. on May 30 and June 11, but by 5th August the plant had but very young flower buds. Such very early specimens have been occasionally noticed in previous years.

Linaria spuria—Fields near Stype woods, E.F.im T.

Veronica montana—Savernake Forest, F.E.T.

Veronica scutellata—Water meadows, Axford, A.P.

Euphrasia officinalis—This, and *Bartsia Odontites* were by no means in full flower on the 5th of August, though specimens were found in flower on June 27 and June 29 respectively. Flowers of the former were very scarce.

Pedicularis palustris—Water meadows, Axford, A.P.

Orobanche elatior—This was found in flower in June at Huish by G.H.D. but was only coming into flower on July 5 near Marlborough.

Verbena officinalis—Roadside, Axford.

Calamintha menthifolia—Roadside, Axford.

Nepeta Cataria—Hedge near Axford, F.E.T.

Chenopodium Bonus-Henricus—Axford Farm.

Polygonum Bistorta—Water meadows near Marlborough, in St. Mary's parish.

Daphne Laureola—Ramsbury.

Triglochin palustre—Axford, E.F.im T.

Butomus umbellatus—Canal near Pewsey.

Orchis pyramidalis—Abundant on the slope of Martinsell Hill.

Orchis latifolia—This seems to have escaped notice this year: it is not uncommon in Axford Marsh.

Neottia nidus-avis—Bedwyn, J.B.K.; W.M.H.M.

Epipactis latifolia—Overton Dell, A.B.P.; not in flower by Aug. 5.

Tulipa sylvestris—A few specimens have re-appeared in the old locality near Martinsell, where it used to be common.

Ornithogalum umbellatum—Found on the Downs about 3 miles from Stonehenge by H. D. Drury, Esq.

Juncus bufonius—Grassy lane at the foot of Martinsell. The dates given for this and the other *Junci* are probably correct, though mostly found in flower on the same day.

Aira flexuosa—Stype woods.

Sclerochloa rigida—Black Burney Bottom, E.F.im T. This species has only once before been found near Marlborough, and then at the foot of Martinsell abbut 18 years ago. It might almost be reckoned as a new species.

Festuca sciuroides—Grassy lane at the foot of Martinsell, with *Juncus bufonius* and *Trifolium filiforme*.

Asplenium Adiantum-nigrum—On a bridge at Little Bedwyn.

Lomaria spicant—Bedwyn, W.H.M D.; Stype wood.

Athyrium Filix-fœmina—Stype.

The *Practical* work of the Botanical Section has therefore been very satisfactory. The Botanical meetings have been very few, and no special branch has been worked at, consequently the *Sectional* work has been very poor indeed.

Names of those whose initials appear in the following List :—

C.W.B.	C. W. Bowlby.
T.G.B.	T. G Brown.
E.L.B.	E. L. Brown.
C.M.B.	C. M. Bull, Esq.
E.M.R.C.	E M. R. Cox.
H.M.C.	H. M. Crookenden
G.H.D.	G. H. Dartnell, Esq.
A.H.D.	A. H. Davis.
G.W.D.L.	Rev. G. W. de Lisle.
F.D.	F. Duncan
W.H.M.D.	W. H. M. D'Urban.
R.H.E.	R. H. Eden.
P.G.E.	P. G. Elgood.
F.W.F.	Rev. F. W. Farrar, D.D., F.R.S.
J.G.	J. Gibson.
J.B.K.	J. B. Kite.
W.H.M.	W. H. Macdonald, Esq.
N.M.	N. Manders.
W M.	W. Mansell, Esq.
W.M.H.M.... ...	W. M. H. Milner.
D E O.	D. E. Olivier.
E.A.O.	Miss E. A. Ormerod.
R.D.P.	R. D. Peele.
A.P.	Miss Amy Preston.
A.B P.	Miss Ada B. Preston.
E.P.	Miss E. Preston.
F.M.P.	F. M. Preston.
W.M.R.	W. M. Richards.
H.M.S.	H. M. Sanders.
C.S.	Rev. C. Soames.
R.T.	Mrs R. Tanner.
H.W.T.	H. W. Thatcher.
F.E.T.	F. E. Thomp on, Esq.
C.E.T.	Rev. C. E. Thorpe.
E.F.imT.	E. F. im Thurn, Esq.
E.G.W.	E. G. Waddilove.
L.Y.	L. Youngs.
M. & T.	W. M. H. Milner and H. W. Thatcher.

The numbers prefixed to the species are the same as those mentioned in the last Edition of the London Catalogue, which we have been obliged, though very reluctantly, to adopt, as the names and order of arrangement have both been considerably altered from what they were in previous Lists.

Clematis—

1 Vitalba ... July22,E.F.im T.

Thaliotrum—

6 flavum ... June 29, F.E.T.

Anemone—

8 nemorosa ... March2,E.M.R.C.

Ranunculus—

12 circinatus ... by July 5.

14 peltatus ... May 9, M. and T.

b. floribundus May 4, F.E.T.

c. penicillatus April 14.

24 Flammula, c. bud, May 20.

27 auricomus ... April 5, F.E T.

28 acris (April 5,F.E.T.) April 14,(one fl.)

29 repens ... (Feb. 24, F.D.; W.M.R.; LY.) Ap. 26, C.E.T.

30 bulbosus ... (Feb. 2, F.E.T.) April.5,F.E.T. only c.bud Ap. 14th. Ap. 26, C.E.T.

33 parviflorus... June 15, (only one plant seen)

34 arvensis ... May 28, (Huish) G.H.D.; June 3, M. and T.

35 Ficaria ... Feb. 15,W.M. R.

Caltha—

36 palustris ... (Jan.20, F.E.T.) Feb.28,F.E.T.

Helleborus—

40 viridis... ... Feb. 26, F.E.T.

41 fœtidus ... (Feb. 28, C.S. Everleigh).

Aquilegia—

42 vulgaris ... May27, M.&T. barely outJune 10, G.W.D.L.

Berberis—

46 vulgaris ... full June 10. M. and T.

Papaver—

50 Somniferum. bud Jne.3,M.&T.

51 Rhœas ... full bud,May 25, W.H.M.; Jne. 1, M.&T.; Jne. 13, F.E.T.

52 dubium

a. Lamottei ... June 10, M. & T.

b. Lecoqii ... ? June23,M.&T.

53 Argemone ... June 6, G.H.D.

Chelidonium—

57 majus .. ... May 7, M. & T.

Fumaria—

64 officinalis ... May 13, C.E.T.

Raphanus—

69 Raphanistrum June 29, M. & T.

Sinapis—

71 arvensis ... May 7, M.andT.

72 alba ... ... fullJne19,M.&T.

Brassica—

75 oleracea ... May 9, M andT.

78 Rapa ... ... May 1, C.E.T.

Diplotaxis—

82 muralis ... June 11, M.&T.

Sisymbrium—

83 officinale ... May 28, M. & T.

86 Alliaria ... April. 26,C.E.T.

Cardamine—

94 pratensis ... April 5, F.E.T. April 14.

95 hirsuta ... March6,G WDL.
96 sylvatica ... May 13, M. & T.
Arabis—
98 thaliana ... May 20, F.E T.
102 hirsuta ... May 25,W.H.M.
Barbarea—
105 vulgaris ... May 2, C.E.T.
Nasturtium—
110 officinale ... June 19,W.H.M.
Armoracia—
114 rusticana ... June 24,W.H.M.
Draba—
118 verna... ... Feb. 7, F.E.T.
March 26,F.E.T.
Lepidium—
138 campestre... May 2, C.E.T.
Senebiera—
142 Coronopus... June29,WMHM.
Reseda—
144 lutea ... ... June 19,W.H M.
Helianthemum—
149 vulgare ... May 25, W.H.M.
Viola—
152 odorata ... March 2, C.W.B.
b. alba... ... March 7.
154 hirta ... ... by Mch.25,N.M.
155 sylvatica ...
a. Riviniana... by April 16.
b. Reichenbachiana April 16.
157 canina ... May 9, M. & T.
160 tricolor ... June 20, M.&T.
b. arvensis ... May 1, C.E.T.
Polygala—
166 vulgaris May 11, F.E.T.
168 depressa ... by May 20, (Bedwyn).
169 calcarea ... May 9. M. & T.
Silene—
178 inflata ... June10,G.W.DL.
187 nocti flora ... bud July 5.
Lychnis—
188 vespertina... May 27, L Y.
189 diurna ... May 5, F.E.T.
190 Flos-cuculi... June 6, M. & T.
193 Githago ... July 2, E.G.W. & T.G.B.
Mœnchia—
195 erecta ... May 8,G.W.D.L.
Cerastium—
199 glomeratum May 8, F.E.T.
200 triviale ... April 26, C.E.T.
Stellaria—
205 aquatica ... July 5.
207 media... ... all the year.
208 Holostea ... April 16.
210 graminea ... June 11, M.&T.
211 uliginosa ... May 10, W.H.M.
Arenaria—
212 trinervis ... May 1, C.E.T.
213 sepyllifolia... May 25,W.H.M.
Sagina—
225 procumbens full June6,M&T.
Spergula—
230 arvensis. June 20,W.H.M.
Hypericum—
250 perforatum July 11.
252 tetrapterum c. bud June 29, F.E.T.
254 humifusum June 29, F.E.T.
256 pulchrum... June 27, M.&T.
257 hirsutum ... July 4, W.H.M.
Malva—
262 moschata ... * July 6, July 8, W.M.R.,July 2, (Draycott)GHD.
263 sylvestris ... June 19,W.H.M.
264 rotundifolia July 3, G.WDL.
Linum—
269 catharticum May 27,W.H.M.
272 usitatissimum byJune27,M.&T.
Geranium—

276 pratense ... June10,W.H.M., June 17,F M.P.
278 molle ... ... May 3,G.W.D.L.
281 dissectum ... May 20, M &T.
282 columbinum June 11, M &T.
283 lucidum ... May 1, C.E.T.
284 Robertianum May 4, W.H M.

Oxalis—
288 Acetosella ... Apl. 8, WMHM and D.E O.

Ilex—
294 Aquifolium full bud, May 16 W.M.H.M.

Euonymus—
295 europæas ... June 10, M.&T.

Rhamnus—
296 catharticus June 10, M.&T.

Acer—
298 Pseudo-platanus ... ... May17,G.WD.L.
299 campestre... May 20, F.E T.

Ulex—
300 europæus ... all the year, just in fl, July 5.

Genista—
303 anglica ... June 6, W.H.M.
305 tinctoria ... July 5, W.H.M.

Sarothamnus—
306 scoparius ... May 5, C.E.T.

Ononis.
308 arvensis ... July 11,July 10, (Oare) G.H.D.

Anthyllis—
310 vulneraria... May14, W.H.M.

Medicago—
314 lupulina ... May 2, C.E.T.

Trifolium—
323 pratense ... May 13, M.&T.
324 medium ... July 5, M.&T.
327 incarnatum May31,G.W.DL.
336 hybridum ... June 27, M.&T.
337 repens ... May 28, M.&T.
339 procumbens June 11, M.&T.
340 minus... ... May 2, C.E.T.
341 filiforme ... full flow.,July 5.

Lotus—
342 corniculatus May 27, W.H.M.
344 major... ... by July 5.

Hippocrepis—
354 comosa ... May 30,W.H.M.

Onobrychis—
355 sativa ... May29,G.W.D.L.

Vicia—
356 hirsuta ... June 6, M.&T.
357 tetrasperma June19,W.H.M.
359 Cracca ... June29,WMH M.
361 sylvatica ... June24, M.&T.
362 sepium ... May 3,G.W.D.L.
364 sativa... ... May14,GW.D.L.

Lathyrus—
371 pratensis ... June 10,W.H.M.

Orobus—
373 tuberosus ... May 1, C.E T. (plentiful in one spot)

Prunus—
378 spinosa ... April 6, C.M.B. Ap.7, D.E.O., May4 WMHM.
381 Avium ... April 6, C.M.B.
382 Cerasus ... May 2, C E.T.

Spiræa—
385 Ulmaria ... June 24, WHM.
386 Filipendula June 22, E.A.O.

Agrimonia—
387 Eupatoria ... June 19, WHM.

Poterium—
390 Sanguisorba May 14, W.M. H.M.

Alchemilla—
392 arvensis ... May 7, F.E.T.
393 vulgaris ... May 6, M. & T.

Potentilla—
397 Fragariastrum Jan. 31, E.G.W., W.M.R; Feb. 28, F.E.T.
400 Tormentilla May 9, M. & T.
402 reptans ... June 20, M. & T.
403 anserina ... May 18, W.H.M.
Fragaria—
408 vesca ... ... May 1 (plentiful), C.E.T.
Rubus—
410 Idæus ... June 3, M. & T.
420 discolor ... July 5
436 rudis (?) ... July 5
448 corylifolius (?) June 29
451 cæsius ... June 10, M. & T.
Geum—
454 urbanum May 3, G.W.D.L.; May 18, W.H.M.
455 intermedium May 9, M. & T.
456 rivale ... full May 7, Huish, G.H.D.; May 9, M. & T.
Rosa—
464 tomentosa ... June 29, F.E.T.
468 canina ... June 18, G.H.D.; June 19, R.H.E.
470 arvensis ... June 20 (Huish), G.H.D.; Ju. 29
Crataegus—
473 Oxyacantha May 4 (Calne), C.E.T.; May 15 (Sav.), F.E.T.; May 19, F.E.T.
Pyrus—
482 Malus ... May 11, M. & T.
Lythrum—
483 Salicaria ... by July 29
Epilobium—
486 augustifolium by July 7, W.M.R.
487 hirsutum ... by Jy 11, H.M.C.
488 parviflorum Jy. 5, W.M.H.M.
489 montanum June 21, F.M.P.
493 obscurum ... July 5
494 palustre July 5
Circæa—
501 lutetiana ... * July 1; by July 5, W.M.H.M.
Myriophyllum—
504 spicatum ... by July 5
Callitriche—
509 stagnalis
b. platycarpa seed July 31
Bryonia—
513 dioica ... June 11, W.H.M.
Ribes—
514 Grossularia March 23, F.E.T.
Sedum—
522 album ... c. b. Jy. 5, F.E.T.
525 acre ... ... June 20, M. & T.
527 reflexum ... bud June 10, M. & T.
Saxifraga—
540 tridactylites April 9, F.E.T.
543 granulata ... May 6, M. & T.; W.H.M.
Chrysosplenium—
549 oppositifolium over May 20
Sanicula—
554 europæa ... bud May 9, M. & T.; May 25, W.H.M.
Helosciadium—
559 nodiflorum Ju. 29, W.M.H.M.
560 inundatum June 15
Sison—
563 Amomum ... July 31
Ægopodium—
565 Podagraria June 3, M. & T.
Bunium—
569 flexuosum ... My. 17, G W.D.L.
Pimpinella—

570 Saxifraga ... July 5

Sium—

573 angustifolium July 5

Œnanthe—

582 crocata ... May 28, M. & T.

Æthusa—

585 Cynapium ... Ju.29, W.M.H.M.

Silaus—

589 pratensis ... July 7, W.H.M.

Angelica—

592 sylvestris ... July 11

Pastinaca—

596 sativa ... June 11, W.H.M.

Heracleum—

597 Sphondylium May 20, F.E.T.; May 27, M. & T.

Daucus—

599 Carota ... June 23, M. & T.

Torilis—

601 infesta ... July 5

602 Anthriscus bud June 29, fl. July 5

603 nodosa ... by July 5

Chærophyllum—

606 sylvestre ... Ap. 9, F.E.T; Ap. 26, C.E.T.

607 temulum ... June 3, M. & T.

Scandix—

609 Pecten-Veneris ... May 16, W.H.M.

Conium—

610 maculatum June 29

Cornus—

616 sanguinea ... Ju. 22, G.W.D.L.

Adoxa—

618 Moschatellina March 7, N.M.

Sambucus—

619 nigra ... ... June 4, M. & T.

620 Ebulus ... full July 31

Viburnum—

621 Opulus ... June 6 (Huish), G H.D.; barren Ju.10, W.H.M.; fertile June 15

622 Lantana ... April 26, C.E.T.

Lonicera—

624 Periclymenum June 22, E.A.O.

Galium—

629 cruciatum ... May 3, C.E.T.

630 verum ... June 27, M. & T.

632 Mollugo ... June 20, M. & T.

633 saxatile ... June 6, W.H.M.

635 palustre ... June 24, W.H.M.

c. Witheringii June 23, F.M.P. and E.L.B.

636 uliginosum full July 5

639 Aparine ... May 18, W.H M.

640 tricorne ... June 23, F.M.P. and E.L B.

Asperula—

641 odorata ... April 26, C.E.T.

642 cynanchica ... June 23, E.A.O.

Sherardia—

643 arvensis ... May 13, M. & T.

Valeriana—

645 dioica ... ... My.4, W.M.H.M.

646 officinalis ... June 19, W.H.M.

Valerianella—

648 olitoria ... My. 3, G.W.D.L.

651 dentata ... Ju.29, W.M.H.M.

Dipsacus—

652 sylvestris ... Aug. 3, A.B.P.

Scabiosa—

654 succisa ... July 31

655 columbaria June 20, M. & T.

656 arvensis ... June 10, M. & T.

Carduus—

660 nutans ... June 18, F.M.P. and E.G.W.

661 crispus ... June 1, M. & T.

662 lanceolatus July 5, F.E.T.; G.W.D.L.
663 eriophorus... by July 29
664 palustris ... June 6, M. & T.
665 tuberosus ... July 14
668 acaulis ... June 27, M. & T.
669 arvensis ... July 5

Arctium—
674 intermedium by July 29
675 nemorosum July 29

Serratula—
677 tinctoria ... July 11

Centaurea—
678 nigra ... ... June 29 W.H.M.
679 Scabiosa ... June 20, M. & T.
680 Cyanus ... Ju. 29, G.W.D.L.

Chrysanthemum—
684 segetum ... full July 5
685 Leucanthemum My. 27, W.H.M.; June 1, M. & T.

Matricaria—
687 inodora ... June 10, M. & T.

Tanacetum—
689 vulgare ... not out Aug. 5

Anthemis—
690 Cotula ... June 29, H.W.T.

Achillea—
694 Millefolium June 19, M. & T.
695 Ptarmica ... full Aug. 3, R.T.

Artemisia—
697 vulgaris ... July 31, E.F.im.T.

Gnaphalium—
705 uliginosum Jy. 5, W.M.H.M.

Senecio—
712 vulgaris ... all the year
713 sylvaticus ... July 11
716 erucifolius ... by July 31
717 Jacobæa ... June 20, M. & T.; June 27
718 aquaticus ... June 20, M. & T.
722 campestris June 11, E.G.W.

Inula—
732 dysenterica by July 31

Bellis—
734 perennis ... all the year

Erigeron—
736 acris June 10, W.H.M.

Tussilago—
741 Farfara ... Feb. 29, F.E.T.

Petasites—
742 vulgaris ... (Jan 31, F.E.T.) by Feb. 19, H.W.T.

Eupatorium—
743 cannabinum July 29, E.P.

Lapsana—
745 communis ... June 25, M. & T.

Hypochœris—
748 radicata ... June 3, M. & T.

Leontodon—
750 hirtus ... July 5
751 hispidus ... May 20, F.E.T.
752 autumnalis June 29

Tragopogon—
755 pratensis ... June 3, M. & T.

Sonchus—
763 oleraceus ... Ju. 20, G.W.D.L.
764 asper ... ... June 10, M. & T.
765 arvensis ... July 5

Crepis—
770 virens... ... June 3, M. & T.

Hieracium—
774 Pilosella ... May 25, W.H.M.
799 vulgatum ... Jy. 5, W.M.H.M.

Phyteuma—
812 obiculare ... by July 14.

Campanula—
814 glomerata ... July 1, W.H.M.
815 Trachelium by July 29, E.F.im T.
818 rotundifolia June 29, W.H.M. July 7, W.H.M.

Specularia—
822 hybrida ... full July 5, W.M.H.M.
Calluna—
840 vulgaris ... c. bud Aug. 3, A.B.P.
Monotropa—
846 Hypopitys July 5, F.E.T.
Fraxinus—
847 excelsior ... Ap.14(one tree); May 1, C.E T.
Ligustrum—
848 vulgare ... June 29, F.E.T.
Vinca—
849 major ... ... May 2, C.E.T.
850 minor... ... full Mch.16, *Miss Cornish.*
Erythræa—
853 Centaurium July 5.
Gentiana—
861 Amarella ... May 30, W.H.M.; June11, W.H.M. none noticed afterwards.
Menyanthes—
863 trifoliata ... c. bud May 8, F.E.T.
Convolvulus—
866 arvensis..... June 29, E.G.W. and T.G.B.
867 sepium ... about July 11.
Solanum—
873 Dulcamara June 11, W.H.M.
Atropa—
875 *Belladonna* *Jn. 20, G.W.D.L.
Verbascum—
877 Thapsus ... June 29, L.Y., W.M.B.
880 nigrum ..... bud July 11.
nigro-Thapsus July 27.
Scrophularia—
884 Balbisii ..... June 24, W.H.M.
886 nodosa ... June 1, M. & T.
Linaria—
892 Cymbalaria May 6, C.E.T.
894 spuria ... by July 31, E.F.im T.
897 vulgaris ... June 23, M. & T.; July 5.
898 minor... ... June 23, M. & T.
Veronica—
902 hederifolia... by Feb. 2, G.W.D.L.
903 polita... ... June 18.
904 agrestis ... fl. & seed July 31.
905 Buxbaumii all the year.
908 arvensis ... full June 15.
909 serpyllifolia May 4, G.W.D.L.
915 officinalis ... June 6, W.H M.
916 Chamædrys Ap.2, E.G.W., May 3, G.W.D.L.
917 montana ... May 20, F.E.T.
918 scutellata ... full July 29, A.P.
919 Anagallis ... June 10, M. & T.
920 Beccabunga May 20, J.B K.
Euphrasia—
921 officinalis ... June 27, M. & T.; not common, July 31.
Bartsia—
922 Odontites ... June29, W.M.H.M.
Pedicularis—
925 palustris ... full, July 29, A.P.
926 sylvatica ... May 1, G.H.D., June 27, M. & T.
Rhinanthus—
927 Crista-galli May 25, W.H.M.;
Melampyrum—
930 pratense ... May 30, W.H M.
Lathræa—
932 squamaria... Ap. 7, R.D.P. T.G.B., P.G.E.

Orobanche—
938 elatior ... June —, G.H.D.; July 5, W.M.R.
941 minor... ... June 20, M. & T.
Verbena—
942 officinalis ... full, July 29.
Mentha—
951 hirsuta ... Aug. 4, W.H.M.
957 arvensis ... July 31.
Thymus—
959 Serpyllum... June 10, M. & T.
Origanum—
961 vulgare ... by July 22.
Calamintha—
962 Clinopodium July 11, W.H.M.
963 Acinos ... July 4, W.H.M.
965 menthifolia July 29.
Nepeta—
968 Cataria ... July 5, F.E.T.
969 Glechoma ... Mch. 15, L.Y.; Ap. 1, E.G.W.
Salvia—
970 Verbenaca... June 11, W.H.M.
Prunella—
972 vulgaris ... June 27, M. & T.
Scutellaria—
973 galericulata July 5, G.W.D.L.; F.E.T.
974 minor... ... full.Jy.31,E.F.imT.
Ballota—
977 nigra ... ... July 11, M. & T.
Stachys—
978 Betonica ... July 5, F.E.T.
980 palustris ... July 1, W.H.M.
982 sylvatica ... July 19, W.H.M.
Galeopsis—
984 Ladanum ... Aug. 4, W.H.M.
987 Tetrahit ... July, 31, E F.imT.
Lamium—
989 amplexicaule June 10, M. & T.
992 purpureum all the year.
994 album ... Mch.18,C.W.B.; Ap. 5, F.E.T.
995 Galeobdolon Ap. 30, C.E.T.
Ajuga.
996 reptans ... Ap. 16, E.P.
Echium—
1003 vulgare ... June 22, L.Y.
PULMONARIA—
1006 *officinalis*... Mar. 11, G.W.D.L,
Lithospermum—
1009 officinale ... May 28, (Huish). G.H.D.; June 1, M. & T.
1010 arvense ... May 27, W.H.M.
Myosotis—
1012 palustris ... *June 6, G.H.D. June 25, M. & T.
1016 arvensis ... May 9, M. & T.
1017 collina ... Ap. 28, C.E.T.
1018 versicolor... May 20.
Anchusa—
1019 arvensis ... in fl. July 5.
Symphytum—
1023 officinale ... Ap. 26, C.E.T.
asperrimum ... June 27, M. & T.
Cynoglossum—
1025 officinale ... June 3, M. & T.
Primula—
1037 vulgaris ... Feb. 5, W.H.M.
b. caulescens .. May 11, M. & T.
1038 officinalis... Ap. 3, E.M.R.C.; A.H.D.; Ap. 16.
Lysimachia—
1047 Nummularia July 3, F.E.T.
Anagallis—
1049 arvensis ... June 18, J.G. & E.G.W.
Plantago—
1061 major ... June 20, M. & T.
1062 media ... June 6, M. & T.
1063 lanceolata.. Ap. 26, C.E.T.

Chenopodium—
1075 album ... July 5.
1083 B. Henricus May 11, C.E.T.
Atriplex—
1085 angustifolia June29,W.M.H.M.
Rumex—
1094 conglomeratusJuly 5.
1095 nemorosus..
b. sanguineus.. nearly out June 29, July 5.
1099 obtusifolius June 3, M. & T.; June 27.
1102 crispus ... June 15.
1104 Hydrolapathum ... bud July 5.
1107 Acetosa ... May 4,W.M.H.M.; May 14, C.E.T.
1108 Acetosella.. May 6, M. & T.
Polygonum—
1111 Convolvulus June 29, H.W.T.
1113 aviculare ... June25,W.M.H.M.
1116 Hydropiper young bud,July29.
1119 Persicaria.. July 5,(very poor).
1122 amphibium July 1, W.H.M.
b. terrestre ... July 5.
1123 Bistorta ... by June 27.
Daphne—
1126 *Mezereum* Jan. 31.
1127 Laureola... Feb.5,N M.,LY., F.D.,* Feb. 2, G.W.D.L.
Thesium—
1128 humifusum July 11,W.H.M.
Buxus—
1132 sempervirens Mch.18,GWDL.
Euphorbia—
1134 Helioscopia April 2, C E.T.
1138 amygdaloides May 1, C.E T.
1144 exigua ... June 23, M.&T.
Mercurialis—
1146 perennis ... Feb. 24, W.M., Feb. 29, L.Y., fertileMh.4NM
Urtica—
1150 dioica ... June 3, M.&T.
1152 urens ... June 4, M.&T.
Humulus—
1153 Lupulus ... bud Aug. 8.
Ulmus—
1155 montana ... Feb. 28, F.E.T.
Quercus—
1156 Robur ... May 20, J.B.K.
Corylus—
1159 Avellana ... barren, Jan. 23, F E.T.; fertile Jan 30, T.G B., L Y., W.M.R.
Salix—
1170 fragilis ... (full) May 5, C E.T.
1174 triandra ... (full) May 19, G.W.D.L.
1178 viminalis... March 4, N.M.
1185 caprea ... Mch 1, WMHM.
Juniperus—
1201 communis May 9, M.&T.
Taxus—
1203 baccata ... Feb. 22, L.Y.
Sparganium—
1206 ramosum .. July 5.
Arum—
1211 maculatum, Ap.26(not open) C.E.T.; May 5, F.E.T.
Potamogeton—
1218 natans ... June 11, M.&T.
1230 perfoliatus in fl. July 5.
1231 crispus ... in fl. July 5.
1239 pectinatus in fl. July 5.
Triglochin—

1249 palustre ... full July 29, E.F.M.T.

Sagittaria—

1252 sagittifolia July 5, G.WDL.

Alisma—

1253 Plantago .. June 27, M.&T.

Butomus—

1257 umbellatus by July 5.

Elodea—

1260 canadensis in fl. July 5.

Orchis—

1263 pyramidalis June 23, M.&T.

1264 ustulata ... June 22, F.E.T.

1268 Morio ... May 4, W.H.M.

1269 mascula ... by May1,C.E.T.

1271 incarnata just out, May 8.

1273 maculata June 11,W.H.M.

Gymnadenia—

1274 conopsea ... June 15.

Habenaria—

1278 chlorantha May 27, M.&T. (bud June 11, W.H.M.)

Herminium—

1280 Monorchis full July 22, E.F. im.T.

Listera—

1289 ovata ... May 20, J.B.K.

Neottia—

1290 Nidus-avis by May20,M.&T; and J.BK.

Epipactis—

1291 latifolia ... full bud Aug. 8, A.B.P.

Cephalanthera—

1297 grandiflora nearly over July 10, G.H.D.

Iris—

1307 Pseudacorus June 4 ?

Narcissus—

1311 Pseudo narcissus ... ... Feb. 29.

Galanthus—

1316 nivalis ... * June 28,Jan.30, H.M.S.

Tamus—

1317 communis, June19, W.H.M.

Paris—

1318 quadrifolia May 6, M.&T.

Polygonatum—

1321 multiflorum June 6, M.&T.

Convallaria—

1323 majalis ... * May 10,T.G.B.

Ruscus—

1325 aculeatus Jan. 31, F.E.T. Feb.4,W.M.R., L.Y.

Tulipa—

1328 sylvestris May 4, F.E.T.

Scilla—

1336 nutans ... April 16.

Allium—

1341 vineale c compactum July 4, W.H.M.

1346 ursinum... May 15, GWDL.

Luzula—

1352 pilosa ... March 30, W.M.H.M

1355 campestris April 6, F.E.T.

1356 multiflora May 3,G.W.D.L.

Juncus—

1365 conglomeratus July 5.

1366 effusus ... June 29.

1367 diffusus ... July 5.

1368 glaucus ... July 5.

1372 acutiflorus June 29, WHM.

1373 lamprocarpus July 5.

1377 bufonius .. full July 5.

Scirpus—

1390 palustris ... June 23, M&T.

1400 lacustris .. budJuly2,HWT.

Carex—

1423 paniculata * May 10, full May 20.
1426 divulsa ... May 7, M.&T.
1443 glauca ... May 6, M.&T.
1452 præcox ... May3,G.W.D.L.
1462 sylvatica .. May14,WMHM,
1474 paludosa ... May 7, M.&T.
1475 riparia ... May 5, C.E.T.

Anthoxanthum—

1488 odoratum May 3, F.E.T.

Digraphis—

1489arundinacea June 24, M.&T.

Alopecurus—

1491 agrestis ... May 27, M.&T.
1493 geniculatus June 6, M.&T.
1495 pratensis... May 4, WMHM.

Phleum—

1498 pratense ... June 15.

Agrostis—

1509 canina ... July 5.
1510 alba ... July 5.
1511 vulgaris ... June 29.

Phragmites—

1517 communis Aug. 6.

Milium—

1518 effusum ... May 19.

Aira.

1520 cæspitosa June 23, M.&T.
1523 flexuosa ... full June 15.

Avena—

1526 flavescens June 9.
1527 pubescens May19,G.W.D.L.
1528 pratensis ... June 15.
1531 elatior ... June 11,M &T.

Holcus—

1532 mollis ... June 29, F.E.T.
1533 lanatus .. May14,WMHM.

Koeleria—

1535 cristata ... June 15.

Melica—

1538 uniflora ... May 27, M.&T.

Glyceria—

1540 fluitans ... May 27, M.&T.
1541 plicata ... June 15.
1542 aquatica ... June 29.

Sclerochloa—

1547 rigida, ... full July 22.

Poa—

1549 annua ... all the year.
1558 pratensis... May 7, M.&.T.
1559 trivialis ... June 3.

Briza—

1560 media ... May 27, M.&T.

Cynosurus—

1562 cristatus ... June 6, M.&T.

Dactylis—

1564 glomerata May 13, (Savernake) May 20.

Festuca—

1568 sciuroides full June 29.
1569 ovina ... May 20.
1570 rubra ... May 8, F.E.T.
1572 elatior ... June 23, M. & T.
b. arundinacea June 27.
1573 pratensis ... June 29.
b. loliacea June 29.

Bromus—

1574 giganteus... full July 29.
1575 asper ... June 11, M. & T.
1576 erectus ... May 13, M. & T.
1579 sterilis ... May 9, M. & T.
1582 commutatus full June 27.
1583 mollis ... May 4, W.M H.M.

Brachypodium—

1585 sylvaticum June 29.
1586 pinnatum.. full Aug. 3.

Triticum—

1587 caninum ... July 5.
1588 repens ... June 27.

Lolium—

1592 perenne ... June 10,M. & T.

Botrychium—

1647 Lunaria ... May 18, F.W.F.

Equisetum—

1658 arvense ... Ap. 26, C.E.T.

1662 palustre ... June 20, W.H.M.

1663 limosum ... May 8, F.E.T.

In addition to the cultivated plants, noted by a * in the preceding list the following have also been noticed.

Æsculus hippocastanum	May 8, F.E.T
Staphylea pinnata	May 8.
Cytisus laburnum	May 21.
Pyrus aucuparia	May 14, M. & T.
Kerrea japonica	full May 23, M. & T.
Ribes sanguineum	March 20.
Cornus mascula	Feb. 22.
Syringa vulgaris	May 6, G.W.D.L.
Symphoricarpos racemosus	June 20, M. & T.
Lycium barbarum	May 25, C.E.T.
Larix europæa	April 6, F.E.T
Wheat	June 23, M. & T.
Rye	June 27, M. & T.
Oats	July 1, M. & T.

ENTOMOLOGICAL LIST.

The following insects have been taken by members of the College. List of nitials:—

T.G.B.	T. G. Brown.
A.B.C.	A. B. Creeke.
P.G.E.	P. G. Elgood.
J.G.	J. Gibson.
J.J.H.	J. J. Hammond.
H.R.H....	H. R. Hordern.
J.W.L.	J. W. Laidlay.
A.B.R.	A. B. Rendel.
G.S.	G. Sharp, Esq.
E.G.W.	E. G. Waddilove.
L.Y.	L. Youngs.

Colias Edusa	seen June 27, A.B.C.
Lasiommata Ægeria	June 27, E.G.W.
Hipparchia Janira	June 27, E.G.W.
H. Tithonus	June 22, A.B.R.
Cynthia Cardui	June 27, J.W.L.
Vanessa Atalanta...	June 24, J.J.H.
Argynnis Aglaia	June 20, W.M.R.
Pamphila Linea	July 12, L.Y.
Anthrocera Filipendulæ	July 12, J.G., E.G.W.
Smerinthus Populi	July 19, H.R.H.
Arctia Caja	July 17, L.Y.
Callimorpha Jacobææ	June 12, Miss Preston.
Mamestra Brassicæ	July 12, L.Y.
Triphæna Pronuba	July 6, L.Y.
Cucullia Umbratica	July 5, L.Y.
Euclidia Mi	June 11, J.G.
Geometra Papilionaria (?)	July 2, G.S.
Abraxas Ulmata	July 5, T.G.B.
Lomaspilis Marginata	June 27, L.Y.
Larentia Miaria	July 12, J.G., E.G.W.
Cidaria Fulvata	July 6, P.G.E.
Hypena Proboscidalis	July 17, T.G.B.
Aglossa Pinguinalis	July 10, T.G.B., P.G.E.

I have made such short residences, separated by such long intervals, in the district, that a complete connected list of my own captures would be too fragmentary to be of any practical value. The following notices are selected from among them as specially interesting, announcing new species or localities. Species new to our lists are denoted as usual by small capitals.

NOCTUINA.

Eremobia Ochroleuca ...	Aldbourn Gorse	August 26.
Xylina Semibrunnea ...	Axford	April 4.

GEOMETRINA.

Cleora Glabraria	Burnt Wood	August 7.
Phibalapteryx Vitalbata	Ramsbury	August 3.

CRAMBINA.

Cryptoblabes Bistriga	Boltsridge	June 27.

TORTRICINA.

Antithesia Corticana	Hen-wood	June 28.
Hedya Pavkulliana ...	Henswood	September 4.
Peronea Tristana	Henswood	September 4.
Orthotænia Antiquana	Ramsbury	August, 1875.
Eupœcilia Nana	Ramsbury	June 26.

TINEINA.

Semioscopis Avellanella	Ramsbury Park	April 4.
Cerostoma Alpella ...	Henswood	September 1.
C. Horridella	Thrup Wood	August 11.
Depressaria Yeatiana	Ramsbury	April 4.
Gelechia Albiceps ...	Henswood	August, 1875.
Glyphipteryx Equitella	Hungerford	June 24.
Coleophora Solitariella ...	Ramsbury	larvæ, April 24.
Laverna Miscella	Thrup Wood	August 15.
Elachista Zonariella ...	Boltsridge	August 14.
Nepticula Pomella ...	Ramsbury	larva, August 5.
N. Salicis	Edgemond's Hill ...	mines, August 8.
N. Septembrella	Boltsridge	larvæ, September 8.
N. Lutella	Henswood	April 25.

E. MEYRICK.

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PROGRESS OF THE SCIENCES DURING THE YEAR 1875.

MR. SPENCER BAIRD publishes annually a record of Science and Industry, which gives in a condensed form the main results of the year. This volume it is almost needless to say gets larger and larger every year, and although no discovery of great importance was made during last year, an immense amount of research was carried on, and the summary of the results alone fills nearly three hundred pages of Mr. Baird's record. From this summary we have taken a few of the more important results.

ASTRONOMY.

As regards instruments and observatories, Dr. Henry Draper has mounted his 26-inch reflector, but at present has had no opportunity of testing its powers. A new observatory is to be erected at Quito, and Professor Gonzalez, of Bogota, is about to erect a new and private observatory, at an altitude of 9000 feet, in latitude 4½° N. A new observatory is being erected at Potsdam, to be solely devoted to observations of the sun.

Professor Langley, of Pittsburgh, has proved that the nuclei of the solar spots are cooler than the neighbouring portions of the sun's surface; also that the heat and light of the sun emanates from the superficies of the nucleus, which is covered by a thin layer of gaseous matter. Violle concludes that the mean temperature of the sun is equal to that of fused steel, that is about 2000° C. Lockyer announces the probable presence of strontium, cadmium, lead, copper, cerium, and potassium in the sun, in addition to the bodies already known to exist in it. Fuhg finds no difference between the equatorial and polar diameter of the sun.

No less than *seventeen* Asteroids were discovered between January 13th and December 18th, 1875, six of the numbers being due to the labours of Palisa at Pola, while four were discovered at Paris, and two at Marseilles. The total number of asteroids discovered since 1845, has now reached 153, and the difficulty of finding names for them is great. Many of the 1875 asteroids have not been named; others have received such names as *Vibilia, Adeona, Lucina, Protogenia.* They have appeared in the heavens as stars of the twelfth or thirteenth magnitude. No new comet has been discovered during the year.

An important observation in reference to the connection between meteoric bodies and comets has been made by Wright, who finds that under suitable

conditions of pressure the gases extracted from meteorites give the same spectrum when ignited as do comets.

The Imperial Academy of Sciences of S. Petersburgh has published an *Uranometria* composed in the tenth century, by the Persian Astronomer Al Sufé. Mr. C. J. Stone has published a catalogue of 1159 stars observed between 1856 and 1861, at the Cape; while the Royal Astronomical Society of London has published Sir John Herschell's catalogue of 10,300 multiple and double stars.

METEOROLOGY.

A number of new meteorological stations have been established by various governments, even in such comparatively remote places (at least as far as centres of science are concerned) as Japan, the Argentine Republic, and the Mauritius.

Williams has shown that the luminous intensity of twilight one minute after sunset is $\frac{92}{100}$, and ten minutes after sunset $\frac{34}{100}$, of what it is at the moment of sunset.

Observations have also been made on the temperature of the air, barometric pressure, winds, and storms. Storm signals are now shown from every important point on the German coast; and the British Meteorological Office reports that no less than 84 *per cent.* of their storm warnings have been verified.

Ballooning has been vigorously prosecuted abroad by De Fonvielle, Croce-Spinelli, and Sivel. But in the unfortunate ascent of April 15th the two last named aeronants lost their lives by asphyxia, probably caused by the rapid flow of gas from the ascending balloon.

The old question of the influence of forests upon rainfall has been examined by M. M. Fautrat and Sartiaux. The experiments were made above the trees of the forest of Hachelte, which covers twelve thousand acres, and at a similar elevation above the surface of cleared land. In all cases the rainfall over the forest was found to be greater than over the cleared land, and the authors conclude that forests form a vast apparatus of condensation.

PHYSICS.

MECHANICS.—Rood has modified Zöllner's pendulum to such an extent that the mean error becomes no more than one thirty-six millionth of an English inch; he proposes to apply it to the measurement of minute changes in the dimensions of solid bodies.

Pfaff has made some curious experiments on the plasticity of ice, and has shown that a very slight amount of pressure causes it to bend. It was also found to elongate by being pulled.

De la Bastie has continued his experiments on the tempering of glass. The various articles having been manufactured in the ordinary way, they are reheated to the point of softening, and plunged in a bath of oil. By this means the glass becomes at least fifty times more resistent and tough than ordinary glass, and so hard that it is not easily cut with a diamond. Water may easily be boiled on a naked fire in vessels made of this glass, and a weight of several ounces may be allowed to fall on it from a height of fifteen feet without fear of fracture. The process is neither difficult nor expensive. If the structure of this toughed glass be examined by polarised light and otherwise, it is found that it is the outer surface of the glass only which consists of this hard glass, while the interior, which has cooled more slowly, is ordinary glass. The contraction of the interior mass has exercised a strong compressing force on the exterior shell.

Lippmann has published an important research on the relations between certain capillary and electric phenomena. He has also devised an apparatus for showing the direct comersion of electrical into mechanical energy, by means of capillarity.

Terquem points out the fact that ammonia gas was liquified so early as 1799, by Guyton de Morveau, in a bath of calcium chloride and snow.

Acoustics.—Lissajous has described an elaborate apparatus for tracing mechanically the curves which represent the composition of vibratory movements; and Schalter has devised an apparatus in which, by means of two pendulums with mirrors attached Lissajous' figures may easily be thrown on a screen.

Decharme has devised a new method of showing sonorous vibrations, by simply blowing a current of air through a tube, the lower end of which is just even with the surface of mercury, contained in a suitable vessel. A musical note is produced, and the mercury is thrown into circular waves. The tubes should be from 0·8 to 5·0 millimetres in internal diameter, and supplied by an uniform current of air. The waves may be projected on a screen, by strongly illuminating the surface of the mercury.

Bresina has described a simple method of comparing the rates of oscillation of two sounding air columns by means of oscillating flames.

Tyndall has continued his researches on acoustic reversibility, and the reflection of sound by layers of air of uneven density.

Neyreneuf has shown the vibratory character of the detonation of a mixture of oxygen and hydrogen gases. In the case of detonating tubes of small diameter a musical note is often poduced by the detonation, and fine striæ may be noticed in the tube perpendicular to its axis.

Mayer has published a redetermination of the durations of residual sonorous vibrations, according to which Ut_1 has a persistence of $\frac{1}{3}$ of a

second on the year, Ut_2 $\frac{1}{25}$, Ut_3 $\frac{1}{70}$, Sol_3 $\frac{1}{125}$, Ut_4 $\frac{1}{150}$, Mi_4 $\frac{1}{175}$, Sol_4 $\frac{1}{175}$, and Ut_5 $\frac{1}{150}$ of a second.

HEAT.—Cailletet has pursued the experiments first proposed by Frankland, on the effect of pressure on combustion. While the luminosity of a flame increases under pressure, the activity of the combustion diminishes: the temperature augments, but the oxidation lessens. A non-luminous flame of alcohol, becomes as bright as that of a candle at twenty atmospheres.

Thomsen has investigated the heat of combination of manganese, zinc, cadmium, and iron.

Boisbaudran has shown that very low temperatures may be produced by means of the Ammonia ice-making machine of Carré, if the heater during cooling be surrounded by ice, or better by a freezing mixture. By this means he has frozen 5 kilogrammes of mercury, the temperature falling as low as — 48° C.

Guthrie has investigated a number of salts which form hydrates at low temperatures, hence called cryohydrates. Thirty-five salts were investigated. The cryohydrates of the nine salts which potassium, sodium, and ammonium, generally form with chlorine, bromine, and sodine, are formed at temperatures ranging from 28° C. to — 11° C.

Chaumont concludes from a number of experiments on ventilation that 3000 cubic feet of air per head per hour is necessary in health, and in ordinary diseases one-third more. This number is so much higher than the usual estimate, that one could almost imagine it a misprint.

Kundt and Warburg have investigated the specific heat of mercury vapour, and the molecule of mercury is shown to be monatomic.

Lundquist has investigated the distribution of heat in the solar spectrum, and he finds that the maximum of heat is situated near the middle of the luminous spectrum.

Hoorweg has repeated the experiments of Tyndall and Magnus, on the diathermancy of moist air. He obtains an intermediate result, and finds that the absorbing power of moist air for heat is much less than Tyndall has found, and much more than the determinations of Magnus.

OPTICS.—In optics the chief investigation of interest mentioned by Mr. Baird is that of Crookes, which led to the *Radiometer*, but this subject surely belongs rather to heat than to light. The Radiometer consists of a small vane delicately balanced in a good vacuum, and is so delicate that rotation may be produced by the radiation of a single candle many feet distant.

Cornu has made a redetermination of the velocity of light. A mean of 504 experiments gives a velocity of 186,700 miles a second. The error probably is below one thousandth of the total.

Jacques has determined the percentage of light transmitted through glass plates, placed both perpendicularly and obliquely to the ray. Taking the original light as 100, one plate transmitted 89·5 per cent., four plates 45 3 per cent. Ordinary window glass was used.

Raget has published a memoir on the conical solar dials of the ancients, particularly that of Heracleus, of Latmos.

Bunsen has given an account of some new methods in spectrum analysis, and his memoir is accompanied by plates showing the spectra of thirty elements and compounds.

Lockyer and Roberts have investigated the absorption spectra of metals volatilized by the oxy-hydrogen flame. The general conclusion at which they have arrived is that in the passage from the liquid to the perfectly gaseous state, the molecules become less and less complex in their arrangement, and each successive spectrum as the temperature rises is marked by an increased simplication.

Wright has investigated the spectra of the gaseous matter evolved from meteorites from various parts of the world. At a red heat a meteorite from Texas gave off 4·75 its volume of gas, while a meteorite from Hungary gave off no less than 44 times its volume. The spectroscope showed these gases to consist of hydrogen, carbonic acid, and carbonic oxide.

Riche and Bardy have investigated the various sources of light which may be utilised for photographic purposes. The lights were found to be photographically intense in the following order, the *last* being eight times as strong as the first:—oxyhydrogen light, Drummond or lime light, the author does not distinguish between these, which are always regarded as the same, perhaps in the first instance the oxyhydrogen was caused to impinge upon some substance other than lime; zinc burning in oxygen, magnesium burning in air; a jet of nitric oxide gas burning in a vessel full of the vapour of disulphide of carbon, a jet of oxygen in disulphide of carbon, and sulphur burning in oxygen.

Magnetism.—Rowland has described a method of determining the distribution of magnetism on iron and steel bars, by means of the electric current, induced in a small coil of wire placed at right angles to the lines of force, and suddenly withdrawn.

Tommasi makes the very curious statement, which we should like to see verified, that if a current of steam with a pressure of from 75 to 90lbs. on the square inch be blown through a copper tube of small bore (2 or 3 millimetres diameter) coiled in a helix about an iron bar, the bar becomes a magnet, and continues magnetic so long as the steam passes.

Electricity.—Edlund maintains that electricity is a function of the luminiferous ether, and accounts for the more important electrical phenomena on his hypothesis.

Whitehorn shows that although glass is a non-conductor of electricity at ordinary temperatures, it becomes a good conductor when heated to redness, and even the temperature of boiling water allows a certain amount of electricity to pass.

Schrotter has proved that when a current of electricity passes through a Geissler's tube containing the vapour of phosphorus, the sides of the tube become coated with amorphous phosphorus. The effect is due to induction not to the direct action of the luminous discharge.

Champion, Pellet, and Grenier have given details of experiments on the applications of electricity to the firing of blasts.

CHEMISTRY.

Pebal has minutely examined euchlorine and hypochloric acid, and concludes that euchlorine is a mixture of hypochloric acid with free chlorine, and that hypochloric acid has the formula $Cl O_2$.

Göpner regards the substance hitherto called hydrate of chlorine, as a hydrate of a molecular union of hydrochloric and hypochlorous acids. This view is combated by Schiff, and will no doubt receive a good deal of opposition.

Regnean has detected bromoform in ordinary commercial bromine.

The chemist of the "Challenger Expedition"—Mr. Buchanan—has proved that if sea-water be artificially cooled, it crystallises in hexagonal tables; if these crystals are melted the resulting water is found to contain 1·578 gramme of chlorine (of course as chloride of sodium) per litre; while iceberg-ice contains only 0·052 to 0·1723 gramme of chlorine per litre. But there would be a considerable difference in the quantity of salt contained in these waters respectively, we should expect from the fact that icebergs are the broken off ends of glaciers, and hence consist mainly of frozen rain water.

Sclone has proved that peroxide of hydrogen, H_2O_2, exists in minute quantity in the rain and snow water collected in the neighbourhood of Moscow.

Schneitzler has found that a solution of borax (Biborate of Sodium) promptly checks fermentation and putrefaction. Infusia, rotifers, tadpoles, &c., are killed in such a solution. Milk containing one grain of borax in thirty cubic centimetres remained sweet for three months, and beef was preserved for a year and a half in a concentrated solution, which was renewed only once in six months. He therefore strongly recommends borax for the preservation of anatomical specimens and for dressing wounds.

Heumann in a paper on the luminosity of flames endeavours to prove (1) that a flame may be rendered non-luminous:—(*a*) by cooling it; (*b*) by diluting it with an indifferent gas; and (*c*) about which there can be no doubt or dispute, by rapid oxidation of the luminous matter; and (2) that the luminosity may be restored (*a*) by heating the flame; (*b*) by raising the tempe-

rature of its combustion, and (c) by diluting the oxygen with an indifferent gas.

Griffin describes a new form of portable gas furnace, in which a pound of cast iron can be melted in thirty-five minutes.

Treve and Ourassier have endeavoured to ascertain the relationship which exists between the chemical composition of a steel and its coercive force. Up to a certain limit (about 1·15 per cent. of carbon) the magnetic saturation increases with the amount of carbon. Hints are given on the choice of steels for various purposes.

J. L. Smith points out a curious fact in connection with magnetic oxide of iron: this substance as ordinarily precipitated is not magnetic, but if it be thrown down from solutions of meteorites it is invariably magnetic on drying: moreover any solution of iron containing nickel, cobalt, or copper, give a precipitate of ferric oxide which becomes magnetic on drying.

Kammarer has obtained crystals of the metal cadmium by distilling it in a current of hydrogen gas; they are octohedrons and dodecahedrons, and their derivatives.

Bibra concludes that when chloride of silver is blackened by the action of light, it is not due to the formation of sub-chloride. The true sub chloride, which may be produced by the action of hydrochloric acid on the citrate of suboxide of silver, has the formula $Ag_4 Cl_2$.

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On the Chalk Rock in Berks	,,
On a Re-constructed Bed on the Top of the Chalk, &c.	,,
On the Western end of the London Basin, and on the Greywethers in Wilts	,,
On the Formation of Cirques	Rev. T. G. Bonney.
On the Superficial Deposits in S. Hants and the Isle of Wight	T. Codrington, Esq.
On the Structure of Xiphosura	H. Woodward, Esq.
On the Oldest known Crab	,,
Notes on Carboniferous Encrinites from Clifton and Lancashire	J. G. Grenfell, Esq.
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PHYSICAL SECTION.

A Paper was read by P. G. MELITUS on

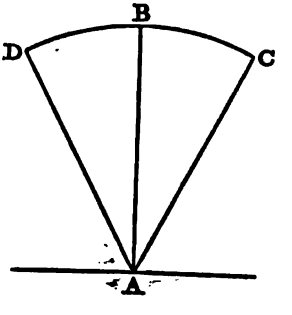
THE DYNAMIC TENDENCY OF PHYSICAL SCIENCE.

I PURPOSE to speak a few words to you this evening on the "Dynamic Tendency of Physical Science," the tendency, I mean, of recent scientific thought to resolve into various kinds of molecular motion forces which were once supposed to be different forms of matter, of a subtle, imponderable fluid. And I intend first to bring to your notice some of these forces of Nature, to examine them separately and show you the historical steps by which they were proved to be various modifications of molecular motion, and secondly to take others which do not admit of such easy individual examination, and show you from the correlations of these forces and the analogies of the phenomena presented by all of them, the extreme probability that they may all be resolved into the same principle, *motion*. In former ages the various phenomena in connection with the physical sciences were held to be due to the presence and action of actual matter, of imponderable fluid, within the objects exhibiting the phenomena; but the light of modern science has completely done away with this view and they are now recognised as having their origin from certain kinds of motion appertaining to the molecules of other objects. Thus Heat is a rapid motion of the insensible parts or molecules of an object conveyed to the brain by the sensory nerves. Light the impact of ether waves against the retina travelling along the optic nerve, Sound the dash of vibrating particles of air against the drum of the ear conveyed by the auditory nerves. By Electricity and Magnetism too we understand a certain motion of the molecules of a body subject to their influence, but the precise nature of the motion has not yet been thoroughly ascertained as in the case of Heat, Light, Sound.

Before proceeding further I must state that the word "Physics" (φύσις Nature) is used in two widely different senses. In ordinary philosophical language it is opposed to the term "Ethics" (ἦθος) to comprehend all the phenomena of the external world, the objective, the great *non-ego*, while Ethics is entirely concerned with the internal, the subjective, the *ego*. In this general sense the word includes not only what is specially denominated "Natural Philosophy," but also the sciences of Chemistry and Natural History. In the special and more restricted sense, however, Physics may be defined as "the knowledge of the properties of bodies, whether as masses or molecules,

and of the actions that appertain to them, such as their readiness to assimilate or communicate various forms of motion" (Mr. Rodwell's *Natural Philosophy* § 1). Taking this as our definition, we see that it allows two distinct branches of Physical Philosophy, the one dealing with the motions of visible masses, the other with the motions of invisible molecules. Under the first head fall the Mechanical Sciences, under the second head Sound, Heat, Light, Electricity, Magnetism, Chemical Affinity, &c. It is chiefly the latter division to which we shall devote our attention this evening; and I purpose first to discuss Sound, Heat, and Light separately and to show them to consist of various forms of molecular motion or energy, and then to mention some correlative forms of energy and to show the identity of these with the above by illustrating their respective correlations.

In pursuance of this plan let us begin with the science of *Sound*. To start with, the word "sound" itself is used in two different senses. In the ordinary language of every-day life it is employed with reference to the physiological actions which constitute the sensation of hearing: in the strict Physical sense, however, it denotes not the sensation but the cause of the sensation, the waves of vibrating air dashing up against the drum of the ear and imparting their vibrations to it, which vibrations are communicated to the brains by the auditory nerves and produce in us the sensation of hearing. This definition, we see, recognises the vibratory nature of sound, and we find that this view has been held about it from the earliest times. Thus in the first century, A.D., Seneca distinctly tells us that the sound of one's voice is a disturbance of the air caused by the tongue; no note, he proceeds, could be heard except for the elasticity of the air; the noise of horns, of trumpets, of musical instruments are all to be attributed to the same source.* Before proceeding any further let us see what we mean by a "vibration." Suppose we take an upright metal spring *A.B.* fixed in a perpendicular position at *A.*, and pull it to one side in the position *A.C*, we shall confer on it a certain amount of potential energy; on releasing it the potential energy thus conferred will be converted into KineticEnergy, which will be sufficient not only to restore it to its original position A.B., but to carry it an equal distance B.D. on the other side. The whole of this motion is a complete vibration or oscillation, and this is the kind of motion of which sound consists. If we repeat the process with a short spring we find that as soon as the vibrations cease to influence the eye they begin to get perceptible to the ear and emit a note which rises in pitch as the



vibrations increase in rapidity. This is just what occurs in the case of all stringed instruments, the pitch of the note rising in proportion to the rapidity of the vibrations: and thus we can distinctly see the vibrations of the strings which constitute the bass notes in such instruments, while the higher the notes rise in pitch, the less distinct do the vibrations become to the eye, and finally cease to affect it at all. But perhaps the most forcible proof of the vibratory nature of sound is the fact that any sound generated in a vacuum is not recognisable by the senses. A single experiment will suffice to illustrate this. If we put a clock-work arrangement for ringing a bell beneath the receiver of an air-pump and proceed to exhaust the receiver, we shall find that in proportion as the air within it becomes more and more rarified, so the strokes of the bell will gradually become fainter and fainter, and eventually will cease to be heard. Now why is this? The reason is that in a vacuum there is no medium to transfer the vibration or motion to our ear. When the bell is rung it is not the actual vibrations of the bell that we hear (for in that case we should have been able to hear it when it was rung in vacuo), but of the medium which receives the motion from the bell and passes it on to our ear: and this medium is the air. In our exhausted receiver the bell was rung, the sound was generated; but there was no medium to communicate it to us, and accordingly we could not recognise it. This experiment may also be cited in refutation of a theory which was proposed at the close of the last century ascribing the phenomena of sound not to the vibrations of the air itself, but of the ether pervading it. The absurdity of this theory is manifest. Were sound a vibration of the ether, we should be able to hear any sound generated in vacuo, as we know that no vacuum devoid of this ether can be obtained. Moreover we know that light is a vibration of the ether and we can see into the interior of a vacuum, while we can not hear any sound generated in it. Thus clearly the ether theory will not hold good. There are also a great many practical instances leading to the proof that sound is a vibration of the air. For example, a very loud noise will often temporarily or permanently injure the drum of the ear: and again, during explosions on a large scale, as in powder-magazines, etc., the windows of the neighbouring buildings are often shattered by the noise of the explosion. There was one of these powder explosions a few years ago in the Regent's Park Canal which did a great deal of damage. We have now considered sound at some length and we have seen that it is not any kind of imponderable matter or any motion of luminiferous ether, but simply a rapid vibration of particles of air.

There is one great difference between the history of sound and the history of the other branches of Physics, namely, that there has never been any material theory of sound, no theory which has ascribed the phenomena of

sound to the presence and influence of actual matter. Heat, Light, Electricity and Magnetism, have each in their day had most strenuous supporters of some such theory; and indeed in the case of the last two sciences, though there is every reason to suppose from the analogy of the other sciences that they will ere long be resolved into forms of motion, yet their dynamic nature has never been proved, and the "fluid hypotheses" are still conventionally employed.

Let us now turn our attention to Heat. At the outset we must know that there are two modifications of heat, the one of which exercises a repulsive influence between the molecules of tangible masses, while the other is radiated through the atmosphere and interstellar spaces with enormous rapidity. The latter form, generally called radiant heat, is closely associated with light. Of radiant heat and light we shall speak presently: let us now turn our attention to the other modifications of heat. I intend to be very brief on this subject, exhaustive as it is, because most of you are familiar with the history of the science of heat, and with the steps by which the material theory was disproved and the Dynamic theory placed beyond a shadow of doubt. In the ancient world very little attention was paid to physical science, ethical subjects engaging the whole of the philosopher's care; but even in this low state of proficiency several eminent philosophers had expressed their opinion that heat was a mode of motion. We know that the Stoics and Epicureans, represented by the writings of Zeno, Epicurus, and Lucretius, held this view. During the middle ages also, this view regarding the dynamic nature of heat was generally received. The most famous writers in favour of it were Cardanus, Telesius of Cosnsa, Francis Bacon, Descutes, John Locke. About the seventeenth century, however, there sprang up a theory opposed to this, called the "Material Theory" or "Theory of Phlogiston" (φλογίζω to kindle), which maintained the existence of a subtle, imponderable fluid "Materia aut principium ignis:" and which for a while completely ousted the dynamic theory. This material theory recognised a kind of matter which was called the "materia" or "principium" of heat, not heat itself (non ignis ipse), the quantity of which was constant and unalterable throughout the universe, and which was only perceptible when passing from one substance to another. No new heat could be generated: any increase of temperature in one body must be attended by a corresponding decrease of temperature in some other body. The first blow aimed at this theory was by Count Rumford of Munich (1798 A.D.) You are all familiar with his experiments, so that I need not describe them here: it is sufficient to state that after experiments with metal shavings at Munich, he contrived an apparatus for effecting the continuous generation of heat by friction, which produced heat enough in two and a half hours to raise as many gallons of water from the ordinary

temperature to boiling point. The second triumph of the dynamic theory was a few years later when Sir Humphrey Davy melted two pieces of ice in a vacuum simply by their own friction. The experiment was final and proved the dynamic theory without any possibility of doubt. The latent heat of water is much greater than that of ice; and this fact was allowed even by the upholders of the material theory, who expressed it by saying that the matter or principle of heat which was stored up in water was greater in amount than that stored up in ice. They were thus bound to admit that in order to convert ice into water a certain amount of extraneous heat must be induced. But when two pieces of ice were melted in a thoroughly insulated apparatus, surrounded by a freezing mixture, it was perfectly clear that no heat could have been applied from without. The ice must therefore have been melted simply by the heat of its own friction. But in spite of such conclusive proofs, the votaries of the Material Theory still clung tenaciously to their opinion, and did not finally relinquish it till the determination of the mechanical equivalent of Heat was effected in 1842-43 by Mr. Joule and Dr. Mayer. We shall see the results of their labours when we come to consider the relation between visible mass motion and Heat. Since that date the Dynamic Theory has been without a rival; and Heat has been universally acknowledged to be a rapid vibration of insensible particles or molecules of matter.

These were the principal steps in the history of the science of Heat; let us now turn to the science of Light, which in many respects bears close analogy to heat. In fact the similarity of the phenomena connected with radiant heat and light, such as the laws governing their reflection, radiation, etc., give us good reasons for supposing that the motion which constitutes Light is only another and more violent form of the motion which constitutes Heat. Thus if we apply Heat to a piece of metal, it first receives additional molecular motion from the fire and expands, then it gets hotter and begins to radiate heat; at "red heat" it emits red light, and if we were able to apply sufficient heat it would finally emit white light. The phenomena of Light also bear in many cases a close analogy to those of Sound, *e.g.*, their propagation, reflection, etc.; but there is an essential difference in the nature of these forces which must not be passed over, namely, that Sound is a vibration of ponderable matter, the Air, while Light is a vibration of the imponderable luminiferous ether: sound requires for its propagation and other phenomena the presence of air or of other gross matter. Light and radiant Heat for their propagation, etc., have no need of such gross matter, and thus it is that it is possible for us to see any object placed within an exhausted receiver, but impossible to hear any sound generated in its interior, the medium through which Light travels being frequent in every vacuous space,

namely, the ether, which, however, is inadequate for the transmission of Sound. The theories which have been proposed about Light are two in number. 1st, The Emission or Corpuscular Theory. 2nd, The Undulatory or Wave Theory. The Emission Theory asserted that Light consists of infinitely minute particles of matter emitted with great velocity by the sun and all luminous bodies, which produces in us the sensation of light by its impact against the retina. But this theory, though it receive the sanction of no less a mathematician and philosopher than Sir Isaac Newton has been altogether superseded by its more fortunate rival. The Undulatory or Wave Theory, on the other hand, supposes the existence of an infinitely subtle and elastic medium, the Luminiferous Ether, diffused through all space. The Sun and all luminous bodies produce oscillations or vibrations in this fluid, and it is the dash of these Ether Waves against the retina which produces in us the sensation of vision. This is the generally received Theory regarding the nature of Light; and the analogy of the phenomena of Light and Sound render it preferable to the Emission Theory. But besides the above there is another view advanced by Sir William Grove in his "Correlation of the Physical Forces," (a book to which I have been greatly indebted in the preparation of this paper) which asserts that Light is result of the vibration or motion of the molecules of the Air itself, rather than of a specific ether pervading the atmosphere. Of course this view has its weak and strong points, but one could scarcely do justice to his arguments in a paper such as the present. The following extract, however, will speak much in his favour. "The Analogies of the phenomena," he writes, "presented by Heat and Light are so close that I can not see how a theory applied to the one agent should not also be applicable to the other. When Heat is transmitted, reflected, refracted, or polarized, can we view that as an affection of ordinary matter, and when the same effects take place with Light, view the phenomena as produced by an imponderable Ether and by that alone?" This opinion, however, has not won many supporters, and the Undulatory Theory still continues predominent in the scientific world.

We have now examined three of the Physical Sciences, the three which most readily admit of individual examination, and we have seen in each case the grounds we have for believing them to be different modes or affections of matter and not forms of matter itself. We have seen that Sound is a vibratory motion of particles of the air, and that Heat and Light are modifications of molecular motion, the former appertaining to tangible masses, the latter to the impalpable interstellar fluid. The forces which we shall consider for the rest of this evening are Visible Motion, Chemical Affinity, Electricity, Magnetism. Unfortunately we have not the direct means of proving that Electricity and Magnetism are forms of Molecular Motion, and

so we can not examine them individually; but I purpose to give instances of their correlations with the other forces of nature, which can leave no possible doubt on the subject.

Let us enter into this part of our subject by considering some of the correlations of *Visible Motion*. All the forces which we are engaged on this evening are forms of motion, but they are the motion of invisible, insensible molecules; while our present subject, is the visible motion of tangible masses, which is recognisable as such by means of the senses. This mass motion is equivalent to and convertible into various kinds of molecular motion in definite proportions; and whenever we see a mass in motion we know that before its motion can be stopped some extraneous force must be applied, which results in the conversion of mass motion into molecular motion. For instance, suppose two bodies to be moving rapidly in opposite directions. They come into collision and their motion ceases; they are at rest. But no motion or force has been annihilated in this instance; it has only been converted from visible mass motion into invisible molecular motion, Heat and Electricity. There are many ways in which Heat may be generated from visible motion. Friction, percussion, compression, are every-day examples. Thus when a nail is hammered, heat is evolved; when a gas is condensed heat is evolved. Conversely during evaporation Heat is absorbed and cold evolved, and we can actually freeze water by the cold evolved during the evaporation of ether. The conversion of visible motion into Heat always takes place in definite proportions. The mechanical equivalent of Heat, or the amount of Heat which is equal to and resolvible into a given amount of visible motion and *vice-versâ* was determined by Mr. Joule, of Manchester, in 1842, and by Dr. Mayer, of Heillbron, in 1843, by two completely different methods: and its determination exercised, as we have seen a most important influence on the history of the science. Dr. Mayer arrived at the determination mathematically by calculating the work done during the expansion of a given volume of gas. Mr. Joule employed the experimental method, and their independent exertions all but coincided with each other. Their result may be thus expressed:—A weight of one pound falling from a height of 772 feet, generates on the stoppage of its motion, Heat sufficient to raise the temperature of one pound of water one degree Fahrenheit, and *vice-versâ*. Conversely Heat may be resolved into visible motion. Thus it has been observed that two bodies heated in vacuo repel each other; and the whole principle of the steam engine depends on the resolution of Heat into visible motion. Electricity, as well as Heat, may be directly generated by friction, percussion, and compression; the difference being that Electricity results from the contact of heterogeneous substances, Heat from the contact of homogeneous substances. On the other hand, the effects of the electric

current are often productive of violent motions. Thus we hear that Napoleon I. was knocked down by a battery of 600 cells, which he had himself presented to the Academy of Sciences at Paris. The attraction of light substances, as saw dust or scraps of paper, by an excited glass rod, or the deflection of the magnetic needle by an electric current are further instances of work performed by Electricity. From visible motion Light may be either directly produced by the contact of moving masses, together with the heat thus generated, or indirectly by means of electricity, magnetism, and chemical affinity have no direct corralations under this head, but are also indirectly convertible to visible motion, through the medium of electricity.

The subject of *Chemical Affinity* next claims our attention. We must remember that according to our definition of Physics given above, it cannot strictly be included among the Physical Sciences, but it is nevertheless one of the forces of nature, and as such is not extraneous to our subject. We must also bear in mind that between Chemical Affinity and the other forces even on considering there is this difference,—namely, that while the rest are various forms of motion, Chemical Affinity is no motion at all, but an attractive force which exercises an insensible attraction between dissimilar particles of matter. The correlations of Chemical Affinity with the other forces are not very marked, but it is convertible into Heat, Light, Electricity, and Magnetism. We know that whenever any chemical combination takes place, Heat is produced, as for instance, when we mix water and sulphuric acid, or pour some cold water over a mass of quick-lime. Conversely chemical combinations and decompositions are often affected by Heat. Thus if we heat copper and sulphur together, we shall get sulphate of copper formed; and the principal method of preparing Oxygen consist in heating the minerals containing it, *i.e.*, Potassie Chlorate and Manganese Dioxide. Light also is present in all rapid combustions, as that of Phosphorus in Oxygen gas, and is thus the result of chemical causes. On the other side Light plays an important part in chemical changes; the entire growth of plants and all vegetable matter depending on the sun's light. It is only in the presence and through the action of sunlight that plants are able to decompose the carbonic acid exhaled by animals, assimilate the carbon, and liberate the oxygen. Moreover the whole art of photography is dependant on the chemical influence of Light. We now pass on to Electricity leaving the correlations of Electricity and Chemical Affinity to be considered under that head.

Electricity is perhaps the force which exhibits more fully and clearly than any other its relations with the other forces. It is directly convertible into Heat, Light, Magnetism, and Chemical Affinity, and *vice versâ*, and very often acts as a medium for the correlations of these forces with one another.

Being then convertible into so many of the forces which we have seen to be various forms of molecular motion, what can be more probable than that Electricity itself is a modification of molecular motion? But the Dynamic nature of Electricity has never been proved, and though no scientific person doubts it at the present day, yet the "fluid" hypotheses and theories have not been displaced by any views more in accordance with modern science. Passing over the correlations of Electricity and visible motion, which we have already considered, we find Heat produced by electrical means when an electric current passes through wire of bad conducting material, as also together with Light in the electric spark and the voltaic arc. Similarly Heat is productive of numerous electrical effects, the phenomena of this change belonging to the science of Thermo-electricity. The reciprocal relations of Electricity and *Magnetism* are of the greatest importance and have led to one of the grandest and most useful inventions of this century. The connection between these forces was first observed in 1819 by Oersted of Copenhagen, who discovered that an electric current was capable of deflecting a magnetic needle. The Electric Telegraph is the result of this observation. Let us here digress for a moment to say that the phenomena of Electricity and Magnetism are so analogous, that any theory which can be applied to the one force must also of necessity be applicable to the other. Moreover the correlations of Magnetism with the other forces of nature are so often through the medium of Electricity that we may take it for granted that whenever Electricity can be converted into any force, Magnetism will also be convertible into it. It will therefore be unnecessary to devote a separate paragraph to the correlations of Magnetism.

Lastly, let us consider the mutual relations of Electricity and Chemical Affinity. The connection between these forces was first hinted at in 1798, when Volta brought forward his "Contact Theory," that Electricity was generated by the contact of two dissimilar metals, by which term are meant metals dissimilar in their chemical properties. This view, however, was set aside by Sir Humphrey Davy, who asserted in his "Chemical Theory" that whenever Chemical Action takes place Electricity is produced, thus clearly establishing the connection between chemical and electrical force. This of course is only applicable to the electric current, but before passing on to that let us see some of the chemical effects of Static Electricity. If we pass a series of electric sparks through a mixture of hydrogen and oxygen in the proportion of two volumes of the former to one of the latter, the composition of water will be the result. If on the other hand we subject ammonia to similar treatment, it will be decomposed into its constituents, nitrogen and hydrogen; while the result of trying the same experiment on oxygen will be to convert it into its allotropic modification, ozone. Thus in these illustrations

FEBRUARY, 1875.

Days of Month.	Mean Readg. of Baromtr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest.	Adopted Mean.	Highst insun's rays.	Lowst. on the grass.	Wind. Direction. A.M.	P.M.	Velocity. Miles.	Mean amt. of Cloud (0 10)	Rain.
											in.
1	30·366	48·2	33·7	38·5	89·6	31·0	W.S.W	S.W.		4·0	
2	30·211	47·1	30·5	36·3	79·2	27·2	W.			6·5	
3	29·971	43·2	33·8	37·4	57·8	30·3	W.			3·0	
4	30·141	40·6	27·5	33·8	84·0	24·8	N.N.E.			2·0	
5	·392	33·8	25·2	28·3	43·8	23·0	N.E.			0·0	
6	·274	38·8	24·6	33·1	44 5	24·9	S.W.			5·0	·62
7	·149	40·0	31·6	35·5	44·2	31·8	E.			5·0	·05
8	·257	32·3	28·6	30·2	47·9	30·4	E.	E.		10·0	
9	·143	33·0	23·6	28·5	51·3	24·4	E.	E.		5·0	
10	·214	33·5	30·9	31·7	42·1	30·4	N.E.			10 0	
11	30·092	49·5	29·6	39 6	58·0	28·4	S.S.E.	S.		10·0	·30
12	29·935	49·5	38·6	44·5	59·3	36·7	S.W.			10·0	·03
13	30·075	47·7	40·3	44·0	51·9	40·8	E.S.E.			0·0	·03
14	·069	52·4	44·9	47·4	58·2	44·1	S.W.			10·0	·05
15	·400	50·5	32·7	39·4	96·0	30·1	N.W.			0·0	
16	·476	47·2	32·5	38·5	91·4	27·8	N.N.W	N.N.W		0·5	
17	·320	42·7	35·2	38·2	49·0	30·2	N.E.	E.		10·0	·01
18	·275	38·7	32·1	34·5	55·2	30·3	N.E.	N.E.		10·0	·02
19	·131	38·4	28·7	30·3	47·8	26·2	E.			10·0	·03
20	·083	32·0	28·2	29·3	49·0	28·2	E.N.E.	E.		10·0	·22
21	·163	35·3	28·5	31·2	108·4	27·6	E.N.E.	E.		9·5	
22	30·147	36·3	25·7	29·7	98·5	23·9	E.	E.		5·0	
23	29·779	33·6	28·5	29·7	103·3	25·8	E.	E.		10·0	
24	·377	32·5	27·6	29·4	54·1	26·1	E.N.E.	E.		10·0	·17
25	·469	38·1	26·9	32·5	104·0	29·3	E.	E.		3·5	·45
26	·474	42·8	33·2	36·7	65·1	31·0	E.S.E.	E.		10·0	·15
27	·687	37·7	29·2	32·0	38·9	29·5	E.	E.		10·0	
28	29·810	30·9	28 8	29·4	34·0	29 0	E.	E.		10 0	
Mns.	30·067	40 0	30·8	34·6	64·5	29·4	...	...	...	6·7	Sum 2·13

MARCH, 1875.

Days of Month.	Mean Readg: of Baromtr. reduced to Sea Level.	Temperature.					Wind.			Mean amt. of Cloud (0-10)	Rain.
		In the Shade.			Highst insun's rays.	Lowst. on the grass.	Direction.		Velocity. Miles.		
		Highest.	Lowest.	Adopted Mean.			A.M.	P.M.			
		°	°	°	°	°					in.
1	29·801	32·2	28·2	30·2	48 0	28·3	E.N.E.	E.N.E.	145	10·0	·02
2	·859	32·4	29·6	31·0	45·4	29·3	E.N.E.	E.N.E.	185	10·0	
3	·919	34·1	29·3	31·7	53·8	30·0	E.N.E.	E.N.E.	185	10·0	
4	·999	36·2	30·0	33·3	41·1	30·0	E.S.E.	E.	176	10·0	
5	·918	43·0	31·7	36·8	87·7	30·0	E.S.E.	S.	235	5·0	·26
6	·685	47·8	37·4	43·4	53·2	34·8	E.S.E.	S.	121	10·0	·57
7	29·858	54·2	46·5	50·4	80·3	43·2	S.W.	W.	294	10·0	·41
8	30·046	54·8	49·9	51·6	74·1	48·1	S.W.	S.W.	273	10·0	
9	·149	53·7	38.5	44·3	106·0	32·6	W.	N.	296	5·0	
10	·420	50·2	29·6	38·7	95·8	25·1	E.	E.	36	0·0	
11	30·205	44·8	31·7	37·1	96·0	29 2	E.	E.	289	5·3	
12	29·974	37·6	33·2	34·8	43·8	33·0	E.	E.	238	10·0	·01
13	29·988	40·2	34·6	36·8	60·6	33·2	N.E.	E.	214	10·0	
14	30·124	45·7	35·7	39·0	96·0	33·0	E.	N.E.	140	2·0	
15	·233	47·3	32·6	36·8	97·3	27·8	N.N.E.	N.	106	5·0	
16	·237	50·7	27·7	38·4	93·9	25·1	N.W.	N.	34	7·5	·02
17	·427	43·7	35·2	37·6	63·8	34·5	N.E.	E.	209	10·0	
18	·538	43·9	28·1	34·7	98·0	25.0	E.	E.	144	5·0	
19	·173	53·8	32·2	41·1	108·9	28·7	W.	N.	145	5·5	
20	·196	44·8	29·6	36.5	104·8	25.0	N.	N.E.	47	5·0	
21	·211	44·1	29·6	36·9	90·5	25·0	N.	N.	106	2·5	
22	·168	49·9	31·6	41·3	76·5	26·2	N.W.	N.E.	48	9·5	
23	·382	49·0	34·9	39·9	111·0	30·5	E.	N.	132	0·0	
24	·422	53·6	35 8	44·0	89·5	31·1	W.	W.NW	52	9·5	
25	·365	54·0	36·5	45·1	105·5	31·0	W.	W.	170	4·8	
26	·228	54·7	41·7	47·3	102·3	37·9	S.W.	W.	197	9·9	·01
27	·135	53·7	33·9	43·7	107·4	29·5	W.	N.W.	128	0·2	·03
28	·347	46 8	33·7	40·4	98·0	28·5	N.	N.	172	10·0	
29	·517	50·8	33·9	43·9	103·8	27·3	W.NW	N.	122	7·5	
30	·549	51·8	39·9	46·0	89·2	37·9	N.N.E.	N.	94	10 0	
31	30·586	55·2	43·2	48·0	96·7	41·0	N.E.	N.	69	10·0	
Mns.	30·182	46·9	34·4	40 0	84·5	31·2	...	...	Sum 4797	7·1	Sum 1·33

APRIL, 1875.

Days of Month.	Mean Readg. of Baromtr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest.	Adopted Mean.	Highst insun's rays.	Lowst on the grass.	Wind. Direction. A.M.	P.M.	Velocity. Miles.	Mean amt. of Cloud (0.10)	Rain.
	in.	°	°		°	°					in.
1	30·575	52·6	42·4	46·8	80·7	39·1	N.	N.	55	10·0	
2	30·405	53·6	36·4	43·8	97·8	28·9	N.W.	N.	97	10·0	
3	29·946	51·7	37·6	45·1	77·8	34·7	W.S.W.	W.	203	10·0	·08
4	·632	54·7	42·7	47·8	108·8	41·1	W.	S.W.	216	8·0	·10
5	·282	51·1	41·6	45·2	106·3	37·0	S.W.	S.W.	520	5·5	·03
6	·443	53·4	38·5	45·2	110·8	34·3	S.W.	S.	504	7·5	·34
7	·438	51·8	35·1	42·4	107·8	31·2	W.S.W	N.	119	6·3	·17
8	29·728	50·0	34·5	41·2	117·8	30·8	N.E.	E.	107	10·0	·29
9	30·038	42·7	37·9	40·1	68·4	36·5	N.E.	N.E.	240	10·0	·07
10	·179	44·2	38·9	41·2	59·2	38·0	E.N.E.	N.E.	202	10·0	·05
11	·178	44·9	39·4	42·4	55·5	39·0	N.E.	E.	174	10·0	
12	·238	46·1	37·4	40·8	56·5	35·9	N.E.	E.	151	5·0	
13	·319	46·8	35·4	39·8	98·6	28·8	E.	E.	165	5·0	
14	·358	55·7	28·5	42·8	106·8	24·5	E.	E.	51	0·0	
15	·411	56·5	33·5	45·4	109·8	29·3	E.	N.E.	65	0·0	
16	·357	56·4	38·4	45·6	109·4	33·2	S.E.	S.	55	5·0	
17	·218	62·1	33·7	48·8	112·5	29·8	E.	N.E.	61	0·0	
18	·111	64·7	34·1	49·3	115·3	29·9	E.S.E.	E.	27	0·0	
19	·155	70·2	36·3	55·8	120·3	32·6	E.	E.	100	0.0	
20	30·114	71·0	38·2	54·2	123·0	33·0	E.	S.W.	88	0·5	
21	29·899	68·7	38·4	52·7	120·7	34·0	N.E.	E.	80	10·0	·21
22	29·914	46 8	37·2	40·1	52·8	37·0	E.	E.	131	10·0	·13
23	30 041	53·3	33·5	44·4	107·7	28·9	E.	E.	124	6·0	
24	·265	52·0	38·5	43·8	109·7	32·0	E.	N.E.	83	1·5	
25	·307	57·7	31·0	45·9	110·7	26·2	N.	S.W.	37	0·0	
26	·156	58·3	34·2	47·1	113·2	28 0	S.	S.W.	106	7·5	
27	·086	62·2	40·3	52·7	116 8	32·0	W.	N.W.	87	2·0	
28	·199	63·0	43·9	50·6	118·7	39·6	W.	W.	146	5·0	
29	·182	61·9	39·2	50·6	119·3	32·3	W.	W.	87	4·0	
30	30·052	66·9	35·4	53·6	125·0	29·8	N.	W.	53	1·5	·17
Mns.	30·075	55·7	37·1	46·2	101·2	32·9	...	...	Sum 4134	5·3	Sum 1·64

MAY, 1875.

Days of Month.	Mean Readg of Baromtr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest.	Mean.	Highst insun's rays.	Lowst. on the grass.	Wind. Direction of the wind. A.M.	P.M.	Velocity Miles	Mean amt. of Cloud (0.10.	Rain.
	in.										in.
1	29·925	54·7	45·5	49·8	71·0	39·3	S.E.	N.E.	47	10·0	·11
2	·978	63·8	45·9	52·4	119·8	42·4	W.	N.	81	5·0	
3	29·962	60·9	38·0	50·7	116·0	34·6	S.SE.	S.	58	4·5	
4	30·022	64·7	48·1	54·9	130·2	42.0	S.E.	N.	80	9·0	
5	29 979	62·6	43·3	51·9	122·0	39·3	S.E.	W.	77	5·5	·01
6	·740	62·7	48·1	54·0	118·1	45·1	S.SW	S.W.	177	10·0	·47
7	·634	56·5	44·1	50·6	96·1	41·4	S.W.	W.	239	10·0	·31
8	·829	60·9	51·0	55·1	119·0	47·9	WSW	S.W.	173	10·0	·24
9	29.935	62·7	46·4	53·6	119·5	42·8	S.W.	W.	183	9·0	·05
10	30.277	61·8	45·8	52·5	118·9	43·1	N.W.	N.W.	71	4·0	
11	·442	64·6	40·7	52·8	121·0	37·4	WSW	N.W.	169	3·0	
12	·382	67·4	43·1	54·3	119·9	38·1	WSW	W.	121	2·5	
13	·331	72·7	44·9	59·2	126·7	40·2	W.	N.W.	68	0·0	
14	·266	75·9	48·0	62·2	126·9	44·4	S.E.	N.W.	29	0·0	
15	·226	79·2	47·9	63·2	132·8	46·1	W.	N.	59	1·0	
16	30·234	67·8	47·6	56·9	120·0	45·3	N.E.	N.E.	97	3·0	
17	29·972	68·7	39·7	54·6	120·9	36·2	S.E.	E.	86	0·2	
18	·637	59·6	48·0	50·4	107·5	42.2	W.	N.W.	105	5·0	·01
19	·735	57·8	41·2	49·1	117·9	36·6	W.	N.W.	274	3·5	·02
20	·774	56·7	42·0	50·2	87·1	38·2	S.W.	W.	195	8·5	·54
21	·711	63·4	50·6	55·4	120·3	47·2	S.	W.	209	5·5	·05
22	29·875	62·6	49·9	55·7	121·8	45·3	S.W.	S.W.	192	8·5	·04
23	30·252	60·0	42·2	51·1	112·9	35·3	S.W.	N.W.	252	2·5	·02
24	·420	65·6	43·2	53·9	126·1	37·3	S.S W	N.W.	112	5·0	
25	·338	66·3	45·5	55·9	120·0	37.5	W.	N.	91	7·3	
26	·311	60·6	42·7	51·4	118·2	35·3	N.	N.	109	4·5	
27	30·195	63·7	40·5	53·5	120·0	33·9	NNW	N.	80	5·5	
28	29·870	62·2	46·4	54·5	116·6	39·3	WNW	N.	70	10·0	·58
29	·900	54·6	44·2	48·4	87·8	42·3	N.E.	N.E.	127	10 0	
30	29·962	60·7	43·4	50·9	118·0	40·2	E.NE	N.E.	147	0·0	
31	30·080	64·2	38·2	52·1	117·6	32·2	S.E.	E.	106	0·3	
Mns.	30·033	63·4	44·5	53·6	115·8	40·3	...	...	Sum 3884	5·3	Sum. 2·51

UNE 1875.

Days of Month.	Mean Readg. of Baromtr reduced to Sea Level.	Temperature.					Wind.			Mean amt. of Cloud (0-10).	Rain.
		In the Shade.			Highst insun's rays	Lowst. on the grass.	Direction.		Velocity. Miles.		
		Highest.	Lowest.	Adopted Mean.			A.M.	P.M.			
	in.	°	°	°	°	°					in.
1	30·176	72·3	43·4	58·4	126·3	36·1	E.N.E.	N.E.	153	0·0	
2	30·110	73·9	47·1	59 9	127·0	42·4	E.N.E.	N.E.	191	4·0	
3	29·950	79·9	49 7	64·5	130·4	45·7	E.N.E.	S.	129	0·3	
4	29 963	76·8	50·2	62·7	129·2	46·1	W.	S.W.	103	4·7	
5	30·005	71·9	45·8	59·9	132·5	42·5	W.S.W	W.	105	6·5	·02
6	·006	69·9	53·6	59·8	130·5	52·0	W.S.W	W.	137	10·0	
7	·155	68·5	51·0	59·0	110·1	47·7	S.W.	W.	249	10.0	·08
8	30·188	72·5	53·6	62·6	132·8	52 5	W.	N.W.	123	2·0	
9	29·775	67·7	51·3	59·1	110·9	50·0	S.E.	S.W.	124	6·5	·39
10	·682	60·7	50·4	55·4	112·4	46·9	S.W.	S.W.	192	9·0	·40
11	·697	59·7	47·8	52·7	118·0	41·2	W.	S.W.	184	7·5	·31
12	·735	59·9	46·3	52·8	114·1	43·0	S.W.	W.	196	5·3	·10
13	·686	56·9	46·0	52·8	102·0	41·6	S.W.	W.	215	10·0	·54
14	·550	61·1	53·0	56·6	106·3	51·5	S.W.	S.W.	216	9·9	·01
15	·473	60·1	47·9	53·8	116·9	43·5	S.W.	S.W.	288	7·0	·21
16	·644	62·0	47·8	54·2	122·3	44·2	S.W.	W.	209	4·8	·12
17	29·865	65·2	43·8	55·3	133·2	41 2	S.S.W.	N.W.	44	8·0	·04
18	30·102	63·7	49·8	54·5	112·2	48·3	N.	S.W.	68	5·0	·01
19	30·151	68·5	43·4	57·1	121·0	39·2	W.	S.W.	77	7·5	·13
20	29·920	69·4	53·6	59·4	128·9	55·5	W.	W.	120	5·5	
21	29·940	63·9	49·1	54·7	121·5	46·0	N.	W.	67	8·0	·01
22	30·204	68·9	40·5	56·5	131·6	34·4	W.	W.	91	2·5	
23	·225	68·0	52·0	58 8	118·0	48·1	S.W.	N.N.W	51	5·0	
24	·226	70·7	45·7	58·5	117·9	42·4	N.E.	W.	57	4·8	
25	·064	69·7	52·3	59·4	122·7	49·4	W.	W.	103	7·5	
26	30·000	67·5	51·4	57·5	126·9	48·3	W.S.W	W.	136	4·8	
27	29·988	65·0	43·5	55·3	122·4	38·9	W.S.W	S.S.W.	80	9·0	·26
28	·835	67·9	51·5	58·5	116·7	51·8	S.S.E.	W.	99	9·0	·08
29	·875	63·8	52·7	58·9	92·8	47·2	N.N.W	W.	51	7·2	·01
30	29·849	64 7	51·1	58·0	107·0	46·5	S.W.	S.	90	9·5	·06
Mns.	29·935	67·0	48·8	57·6	119·8	45·5	...	...	Sum 3948	6·4	Sum 2·78

JULY, 1875.

Days of Month.	Mean Readg. of Baromtr reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest.	Adopted Mean.	Highst insun's rays	Lowst. on the grass.	Wind. Direction. A.M.	P.M.	Velocity. Miles.	Mean amt. of Cloud (0-10).	Rain.
	in.	°	°	°	°	°					in.
1	29·709	68·7	57·0	62·0	123·2	53·8	S.S.E.	S.	119	7·5	·01
2	29·782	65·9	55·0	60·6	111·0	54·4	W.	W.	121	10·0	·39
3	30·028	59·5	52·9	55·9	80·2	51·7	WNW	N.N.E.	105	10·0	·15
4	·350	64·5	51·6	55·6	93·3	50·8	N.E.	E.N.E.	106	5·0	
5	·347	71·7	44·7	59·3	122·7	38·4	N.E.	N.E.	84	0·0	
6	·342	72·7	54·2	61·6	124·4	50·9	E.	E.N.E.	101	5·3	
7	30·242	70·3	56·6	61·2	128·0	46·1	E.	N.E.	111	8·5	
8	29·979	70·4	51·6	60·5	118·8	46·3	N.E.	N.N.W	57	10·0	
9	·565	62·8	53·4	57·8	83·4	49·5	S.W.	W.S.W	120	10.0	·54
10	·682	63·7	50·3	56·2	127·3	46·3	W.	W.	229	9·5	·29
11	29·666	61·5	45·5	52·8	117·7	43·7	W.	W.	235	6·0	·01
12	30·147	63·7	47·2	54·0	123·5	42·5	N.W.	N.E.	159	5·0	
13	30·191	65·7	39·6	55·8	123·2	36·6	WNW	S.	42	7·0	
14	29·830	56·5	46·4	53·0	70·7	40·1	S.E.	S.E.	113	10·0	2·32
15	·668	60·0	52·8	56·1	84·9	51·9	E.	N.E.	207	10·0	·66
16	·879	60·2	53·6	56·9	80·0	53·6	E.N.E.	N.E.	236	9·5	
17	·858	61·7	52·9	57·7	86·8	50·4	N.E.	N.E.	104	10·0	·27
18	·781	67·7	55·7	60·6	99·0	54 0	E.	S.S.E.	72	8·0	
19	·871	71·6	56·0	61·8	128·8	53·3	S.	E.N.E.	49	9·2	·58
20	·984	65·2	54·6	59·0	101·8	52·1	W.	W.	93	10·0	·09
21	·921	62·0	53·7	56·8	79·1	53·3	W.	N.W.	129	10·0	·13
22	.806	71·6	52·8	60·9	144·4	47·6	WNW	W.	69	6·5	
23	·707	68·7	52·5	59 5	125·2	48·1	W.	W.	80	8·7	·16
24	29·765	67·0	51·3	57·0	127·7	47·3	S.W.	W.	137	6·5	
25	30·053	66·5	42·2	54·0	127·0	38·4	W.	W.	113	4·5	
26	·346	69·9	41·4	57·2	123·4	37·0	W.	W.	38	0·7	
27	·371	69·5	42·5	57·8	125·8	39·2	S.S.E.	E.	68	6·5	
28	·345	73·9	45·5	60·4	130·2	40·2	E.	E.	67	2·0	
29	·311	76·7	48·3	63·8	129·1	44·2	E.	W.	42	3·0	
30	·219	69 8	52·3	59·8	125·3	48·4	WNW	N.	76	7·5	
31	30·172	65·3	43·9	54·8	118·6	38·4	N.	N.E.	56	2·0	
Mns.	29·998	66·6	50·3	58·0	112·4	46·7	...	...	Sum 3338	7·0	Sum 5·60

AUGUST, 1875.

Days of Month.	Mean Readg: of Barometr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest.	Adopted Mean.	Highst insun's rays.	Lowst on the grass	Wind. Direction. A.M.	P.M.	Velocity. Miles.	Mean amt. of Cloud (0-10)	Rain.
											in.
1	30·225	67·8	41·2	55·7	121·6	37·4	E.N.E.	E.	102	0·5	
2	·203	66·9	42·2	56·0	120·8	39·2	E.	N.	47	7·5	
3	·128	71·7	47·3	59·5	133·8	45·8	E.N.E.	N.	37	7·5	·03
4	·144	64·7	49·5	56·7	120·0	45·1	N.	N.	86	7·5	
5	30·073	64·9	44·1	55·5	108·8	39·5	N.E.	N.	82	9·0	
6	29·964	67·7	55·6	61·7	100·0	55·0	N.E.	E.	106	9·5	
7	30·025	65·3	57·1	61·4	74·8	57·0	N.E.	N.E.	82	10·0	
8	30·012	76·7	56·8	65·7	134·7	52·3	N.W.	S.	30	7·5	·22
9	29·834	71·9	58.1	62·6	126·0	56·0	S.	W.	174	10·0	·02
10	·828	69·9	58·0	62·2	125·0	57·0	S.S.E.	S.W.	181	9·5	·20
11	·911	73·2	59·0	64·2	131·0	57·5	W.	W.	142	10·0	·27
12	·784	70·7	60·3	63·4	112·4	59·5	S.W.	S.W.	110	7·0	·97
13	29·925	71·7	58·3	63·4	123·2	57·4	N.W.	S.W.	120	8·0	·91
14	30·052	73·6	58·9	65·4	130·6	56·0	S.W.	W.	154	6·5	·01
15	·143	75·7	59·1	65·9	130·0	57·3	S.W.	S.E.	177	6·0	
16	·020	81·9	58·2	69·0	133·9	52·5	S.	S.	139	4·5	
17	·637	71·9	53·7	63·3	121·0	46·6	S.	W.	109	9·5	
18	·138	73·2	57·4	62·5	130·7	54.0	W.	N.W.	116	4·5	·02
19	·185	68·7	51·1	60·9	107·0	47·1	N.E.	N.	29	9·5	
20	·304	73·2	53·6	61·5	123·7	49·7	N.	N.	60	0·5	
21	·380	72·3	44·1	58·7	127·0	40·9	W.	N.W.	51	1·5	
22	·270	72·7	48·5	59·6	126·8	42·2	N.W.	N.W.	48	4·0	
23	30·062	72·7	46·6	59·8	135·5	42·7	W.	W.	59	2·5	
24	29·916	74·7	47·3	61·9	138·6	42·7	W.	W.	40	9·0	
25	29·914	72·0	56·8	63·0	118·2	51·0	S.W.	W.	124	6·5	·03
26	30·048	71·2	54·7	60·8	125·8	47·1	S.	N.W.	130	5·5	·06
27	·141	71·5	47·8	58·7	127·2	43·0	N.E.	N.W.	36	6·0	
28	·044	61·5	50·8	55·5	81·6	46·3	S.E.	N.	36	10·0	·26
29	·016	70·5	52·8	60·4	128·4	51·5	W.	N.W.	87	2·0	
30	·107	66·0	49·3	57·8	118·8	41·8	W.	W.	116	2·0	·02
31	30·161	68·8	51·1	58·6	121·8	43·5	N.W.	N.W.	133	1·5	
Mns.	30·064	70·8	52·6	61·0	121·3	49·0	...	...	Sum 2993	6·3	Sum 2·12

SEPTEMBER, 1875.

Days of Month.	Mean Readg. of Baromtr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest.	Adopted Mean.	Highst insun's rays.	Lowst on the grass.	Wind. Direction. A.M.	P.M.	Velocity, Miles.	Mean amt. of Cloud (0.10)	Rain.
	in.	°	°	°	°	°					in.
1	30·289	67·4	43·9	57·0	121·6	39·3	N.W.	W.	60	10·0	
2	·193	71·5	57·3	62·2	133·3	55·3	S.W.	S.W.	116	7·5	·21
3	·062	68·3	54·4	59·2	124·0	51·2	S.	W.	184	5·5	·16
4	·189	68·7	48·9	58·5	128·1	44·7	W.	N.W.	83	2·0	
5	·304	72·5	47·8	59·1	133·6	43·9	W.	N.W.	46	2·0	
6	.299	72·5	45·7	59·8	128·1	42·9	E.	S.	55	0·0	·01
7	30·072	75·1	49·2	62·5	124·3	44·7	S.E.	S.	101	0·5	·01
8	29·875	72·8	54·6	62·2	102·6	49·6	N.	N.	69	10·0	·06
9	29·936	67·0	47·7	57·0	127·7	43·2	W.	S.W.	115	1·0	·31
10	30·025	64·3	47·6	54·6	107·8	43·6	E.	E.	45	4·0	·06
11	·257	68·7	41·2	56·7	118·0	38·2	N.E.	N.E.	79	0·5	
12	·316	64·5	51·6	57·9	97·8	45·1	E.	E.	105	10·0	
13	·251	73·5	55·3	61.3	117·0	55·3	N.E.	E.	205	5·0	
14	·220	69·4	55·3	60·3	119·8	49·7	N.E.	E.N.E.	212	4·0	
15	·173	68·7	53·2	59·0	117·3	47·1	E.	E.	177	4·0	
16	·090	71·6	49·2	60·2	119·1	43·3	E.	E.	107	3·0	
17	·094	75·7	51·0	62·3	128·8	46·1	E.	E.	67	5·5	
18	·046	78·0	53·5	65·1	125·2	48·7	E.	E.	107	7·0	
19	30·009	75·8	57·6	64·5	129·1	55·2	E.	E.	109	9·0	·34
20	29·998	72·2	53·0	61.4	129·0	46·9	S.W.	Calm	82	5·0	
21	·868	62·2	55·8	59·2	73·2	51·4	S.	Calm	51	10·0	·88
22	29·871	68·4	57·1	61·2	96·0	56·3	W.	Calm	84	10·0	·08
23	30·112	57·9	51·9	54·0	60·6	51·3	E.	E.	216	10·0	·34
24	30·004	60·6	51·9	56·7	85·8	51·3	S.E.	W.	273	10·0	·11
25	29·963	65·9	52·1	57·9	114·6	47·9	S.W.	W.	157	10·0	·01
26	·710	65·7	51·2	58·7	110·9	45·3	S.W.	S.	192	10·0	·09
27	·817	60·8	48·3	53·8	116·3	44·5	S.W.	W.	248	6·5	·37
28	·760	59·7	51·0	54·6	102·8	48·6	W.	Calm	223	10·0	.76
29	29·904	62·2	41·8	52·4	104·2	37·2	W	W.	103	4·0	
30	30·081	64·4	46·3	54·6	120·0	40·8	N.W.	Calm	127	6·0	·01
Mns.	30·060	68·2	50·8	58·8	113·9	47·0	...	...	Sum 3798	6.1	Sum 3·78

OCTOBER, 1875.

Days of Month.	Mean Readg. of Baromtr. reduced to Sea Level.	Temperature.					Wind.			Mean amt. of Cloud (0.10.	Rain.
		In the Shade.			Highst insun's rays.	Lowst. on the grass.	Direction of the wind.		Velocity Miles		
		Highest.	Lowest.,	Mean.			A.M.	P.M.			
	in.										in.
1	29·937	65°3	50°0	57°7	110°0	47°9	S.W.	S.	117	10°	·09
2	·828	59·6	46·8	51·9	100·7	42·2	S.S W	W.	146	5·3	·80
3	·811	56·1	44·7	51·2	69·2	40·9	S.W.	S.W.	160	9·0	·23
4	29·877	62·3	52·9	58·6	81·0	48·8	W.	W.	242	9·5	
5	30·101	67·6	49·6	57·4	114·9	46.2	S.W.	W.	192	4·5	
6	·484	60·7	44·3	51·4	110·5	39·2	W.	W.	161	0·0	·02
7	·393	62·4	45·4	54·4	103·1	40·2	W.	W.	99	7·5	
8	30·018	59·0	49·6	53·2	101·2	45·1	S.SW	E.	92	7·0	
9	29.762	52·7	40·3	46·6	81·8	37·5	N.W.	N.W.	126	9·5	1·32
10	·807	55·8	34·6	46·2	103·2	29·5	S.W.	W.	101	9 9	·26
11	·325	55·4	38·1	45·2	107·0	34·4	W.	W.	178	6 0	
12	·410	54·9	31·9	42·4	110·8	28·8	W.	W.	39	0·0	
13	·251	52·7	32·5	41·0	91·4	26·9	E.	E.	84	9·8	
14	·362	49·9	36·0	43·9	88·6	29·9	N.	N.E.	38	9·0	·27
15	·626	53·2	41·5	46·0	87·1	36·4	N.E.	W.	160	5·0	
16	·778	55·6	39·3	43·9	102·1	34·2	N.	Calm.	54	5·0	
17	·795	55·9	37·4	47·1	83·3	31·6	E.	S.E.	96	8·5	·02
18	·751	54·6	49·4	51·0	85·0	46·3	E.SE.	E.N.E.	194	9·5	·62
19	·673	51·0	48·5	49·3	54·1	48·0	S.E.	E.	243	10·0	·111
20	·491	50·0	47·7	48·3	56·3	47·1	E.	W.	126	10·0	·16
21	·543	57·5	47·7	51·2	83·0	44·2	S.	S.	76	8·7	·28
22	·476	53·7	43·0	48·1	76·0	36·4	S.	E.	124	5·0	·104
23	29·510	51·2	43·0	47·1	89·4	37·7	S.	E.	70	10·0	·26
24	30·102	50·5	42·8	46·0	71 9	37·9	E.N.E.	Calm.	75	9·7	
25	30·204	54·0	37·5	45·1	98·9	31·7	E.S.E.	E.	60	5·5	
26	29·980	47·9	43·3	45·1	69·8	42·2	S.E.	S.E.	179	10·0	·52
27	·693	43·9	40·0	41·2	52·6	40·0	S.E.	S.E.	253	10·0	·43
28	29·942	45·6	40·3	42·8	50·3	40·8	S.E.	E.	129	10·0	·21
29	30·078	46·6	37·6	41·0	75·5	29·4	E.	E.	66	·01	
30	29·945	41·7	35·4	39·0	49·0	30·3	S.E.	E.	I92	10·0	
31	29·856	45·4	38·8	41·5	69 8	38·5	S.E.	S.E.	123	10·0	
Mns.	29·800	54·0	42·3	47·6	84·8	38·4	...	...	Sum 3995	7·5	Sum. 7·64

NOVEMBER, 1875.

Days of Month.	Mean Readg. of Barometr. reduced to Sea Level.	Temperature					Wind.			Mean amt. of Cloud (0 10)	Rain.
		In the Shade			Highst insun's rays.	Lowst. on the grass.	Direction.		Velocity. Miles		
		Highest.	Lowest.	Adopted Mean.			A.M.	P.M.			
		°	°	°	°	°					in.
1	29·896	45·0	33·9	40·0	62·9	29·7	E.S.E.	E.	127	10·0	·04
2	·886	53·2	40·7	47·5	52·5	40·2	S.E.	E.	160	10·0	·12
3	·803	55·5	52·3	53·6	59·8	52·2	S.	N.W.	145	10·0	·11
4	·878	59·4	48·3	52·5	101·2	45·4	S.	S.W.	56	10 0	·01
5	·798	56·5	48·2	52·6	62·8	43·7	S.W.	W.	197	9·0	·58
6	·278	55·7	48·1	51·0	93·0	45·2	W.	W.	282	10·0	·09
7	·355	50·5	39·5	43·1	96·5	37·4	W.	W.	179	7·5	·55
8	·536	46·8	31·7	37·0	90·8	25·9	W.	E.	148	4·0	
9	29·292	48·7	30·2	39·9	58·9	24·4	E.	W.	98	10·0	·33
10	28·894	48·6	43·4	44·8	59·9	41·5	N.N.W	E.	174	10·0	·67
11	29·410	44·4	34·6	39·6	66·1	33·9	N.N.W	S.	174	9·9	
12	·929	50·8	35·4	44·0	83·1	30·2	W.	N.	99	2·0	·41
13	·514	55·4	37·5	47·5	54·0	35·4	S.E.	W.	155	10·0	·79
14	29·449	55·2	39·7	44·8	54·5	36 3	S.W.	N.	395	5·0	·12
15	30·251	49·6	30·6	37·6	89·2	26·3	W.	W.	69	5·0	
16	29·990	50·7	34·0	43·9	76·7	29·3	S.S.E.	W.	164	6·7	·25
17	30·058	53·9	42·4	48·9	53·1	39·8	W.	W.	292	10·0	·13
18	30·132	57·6	50·6	53·1	92·8	48·3	W.	W.	321	9·9	·13
19	29·817	53·6	46·2	49·2	92·5	44·9	W.	W.	329	6·0	·02
20	30·121	46·9	32·5	36·7	72·8	30·0	N.	W.	197	0·1	
21	·078	40·9	31·4	35·8	64·8	28·7	N.	N.	116	6·0	
22	·224	39·1	35·2	36·8	55·4	33·3	N.	E.	101	9·0	·01
23	·233	41·4	34·6	37·8	64·3	33.4	N.E.	E.	114	10·0	
24	·191	39·1	34·7	36·4	47·0	34·4	E.N.E.	E.	144	10·0	
25	·086	36·9	28·3	31·7	60·2	23·1	E.N.E.	N.	62	5·0	
26	·033	34·8	25·8	31·0	46·0	21·6	N.N.E.	E.	48	10·0	
27	·098	35·9	28·2	32·5	47·5	24·1	N.N.E.	E.	180	9·0	
28	·153	35·3	32·3	33·5	38.7	30·3	E.	N.E.	183	10·0	
29	30·014	35 0	31·2	32·6	44·9	30.2	E.N.E.	E.	171	8 5	
30	29·916	33·0	28·4	29·9	40·2	26·9	N.E.	E.	210	9·0	·02
Mns.	29·842	47·0	37·0	41·4	66·1	34·2	...	...	Sum 5090	8·0	Sum 4·33

DECEMBER, 1875.

Days of Month.	Mean Readg. of Baromtr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest.	Adopted Mean.	Highst insun's rays.	Lowst. on the grass.	Wind. Direction. A.M.	P.M.	Velocity. Miles.	Mean amt. of Cloud (0-10.)	Rain.
	in.	°	°	°	°	°					in.
1	29·928	33·2	27·2	30·1	39·4	25·4	N.E.	E.	164	6·5	
2	·837	34·9	30·2	32·0	44·9	27·9	N.	E.	150	10·0	·35
3	.875	32·7	27·8	30·0	45·2	26·2	N.N.E	N.	64	9·5	
4	29·938	34·1	26·2	29·1	47·8	25·7	NNW	N.	83	4·7	
5	30·094	32·2	20·0	25·1	81·2	19·3	NNW	N.	82	0.5	·04
6	·240	31·6	19·0	27·2	40·4	18·0	N.E.	E.	241	10·0	·17
7	·445	32·8	25·4	29·7	51·0	23·8	N.E.	N.	109	9·5	
8	·472	35·7	30·5	32·6	46·9	29·2	N.	N.	59	10·0	
9	·460	36·8	23·7	29·8	60·9	17·5	N.W.	N.W.	73	10·0	
10	·347	39·4	25·4	33·3	67·0	21·6	W.	W.	96	2·5	
11	·205	40·7	35·0	37·2	50·0	32·5	W.	N.W.	105	5·5	
12	·202	42·7	33·3	37·0	47·8	27·7	W.	N.W.	127	6·0	·01
13	·251	42·6	28·2	33·7	49·8	23·2	N.W.	Calm.	19	5.0	
14	·148	38·1	26·0	32·6	43·5	22·1	N.E.	S.E.	52	10·0	·01
15	·162	39·8	32·8	36·7	44·2	32·5	S.S.E.	Calm.	104	10·0	
16	30·124	40·6	35·4	37·7	46·8	35·4	S.E.	S.E.	58	10·0	·01
17	29·964	46·6	37·8	42·2	76·0	37·8	S.	S.	93	10·0	
18	·841	45·6	41·2	43·9	47·3	40·2	S.S.W.	S.	159	10·0	·07
19	·637	46·6	39·2	42·5	84·0	35·7	S.	W.	200	5·0	·04
20	·657	51·4	38·5	46·1	58·0	35·2	S.	W.	245	9·5	·17
21	·829	51·7	39·3	45·3	55·4	33·9	W.	W.	381	6·5	·25
22	29·769	52·9	43·3	47·9	84·4	40·2	S.S.W.	W.	224	4·5	·08
23	30·195	48·8	37·5	42·3	82·0	33·2	S.W.	S.W.	232	0·0	·01
24	·196	49·9	41·1	46·0	61·0	37·6	S.W.	W.	271	7·5	·04
25	·443	49·0	37·7	42·0	78·4	35·1	W.	W.	161	8·0	
26	·474	48·1	39·5	44·2	58·7	38·0	W.	Calm.	76	10·0	·01
27	·483	48·5	40·9	43·0	50·2	40·6	S.W.	W.	84	10·0	
28	·543	45·4	40·9	42·7	49·4	40·3	W.	W.	67	9·5	
29	·431	45·1	41·0	42·6	56·0	39·4	WSW	Calm.	93	9·7	·01
30	·316	46·2	41·4	43·3	52·9	39 9	W.	W.	70	9·8	
31	30·096	45·5	37·9	42·0	48·1	35·1	S.	S.W.	228	10·0	·09
Mns.	30·148	42·2	33·7	37·7	56·4	31·4	...	...	Sum 4170	7·7	Sum 1·31

1875.

SUMMARY.

Month.	Mean Reading of the Barometer (reduced to Sea Level	Temperature. In the Shade. Highest.	Lowest.	Mean of all the Highest.	Mean of all the Lowest.	Adopted Mean.	Dew Point.	Mean of all the Highest in the sun's rays.	Mean of all the Lowest on the grass.	Degree of Humidity (Saturation = 100)	Wind. Direction. Proportion of N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Velocity.	Amount of Cloud.	Rain. No. of days it fell.	Amount collected.
	in.	°	°	°	°	°	°	°	°										Miles.			in.
January	29·934	52·7	28·5	47·6	39·5	43·2	40·7	64·1	37·3	92	0	0	2	4	8	7	10	0	...	8·5	23	4·53
February ...	30·057	52·4	23·6	40·0	30·8	34·6	31·0	64·5	29·4	89	1	6	11	2	0	4	2	2	...	6·7	13	2·13
March	30·182	55·2	27·7	46·9	34·4	40·0	34·9	84·5	31·2	84	8	5	8	1	1	2	4	2	4797	7·1	8	1·33
April	30·075	71·0	28·5	55·7	37·1	46·2	40·2	101·2	32·9	81	3	5	10	1	1	4	5	1	4134	5·3	11	1·64
May.....	30·038	79·2	38·0	63·4	44·5	53·6	47·0	115·8	40·3	80	5	3	1	4	1	5	7	5	3884	5·3	13	2·51
June	29·935	79·9	40·5	67·0	48·8	57·6	51·4	119·8	45·5	82	1	3	1	1	1	10	11	2	3948	6·4	18	2·78
July.....	29·998	76·7	39·6	66·6	50·3	58·0	53·2	112·4	46·7	85	2	6	5	2	2	2	10	2	3338	7·0	13	5·60
August	30·064	81·9	41·2	70·8	52·6	61·0	55·1	121·3	49·0	84	4	4	2	1	3	4	7	6	2993	6·3	13	2·12
September ...	30·060	78·0	41·2	68·2	50·8	58·8	54·6	113·9	47·0	89	1	3	9	1	3	4	7	2	3798	6·1	17	3·78
October	29·800	67·6	31·9	54·0	42·3	47·6	44·4	84·8	38·4	93	1	2	8	6	3	3	7	1	3995	7·5	17	7·64
November ...	29·842	59·4	25·8	47·0	37·0	41·4	38·2	66·1	34·2	94	5	3	7	2	1	2	9	1	5090	8·0	18	4·33
December ...	30·148	52·9	19·0	42·2	33·7	37·7	34·8	56·4	31·4	93	5	2	2	2	3	4	10	3	4170	7·7	16	1·31
Year	30·012	81·9	19·0	55·8	41·8	48·3	43·8	92·1	38·6	87	36	42	66	27	27	51	89	27	...	6·8	180	39·70

THE foregoing observations differ in the following respects from hose published in the 18th and 22nd Half-yearly Reports, viz.:—(1) the instruments have been placed in the garden of the Rev. T. A. Preston's house, The Green, in a better position than could be obtained at the College; (2) a Stevenson's Stand has been employed, the bulbs of the thermometers being 4 feet above the ground; (3) the maximum thermometer in the sun's rays has been placed on a post 4 feet above the ground; (4) the observations have been taken at 9 a.m. and 9 p.m.; (5) the barometric readings are reduced to sea level; and (6) the observations are uncorrected for diurnal range.

The garden in which the thermometer stands and rain-gauge are exposed is quite level, but is surrounded by low buildings on the south and south-east, and by somewhat higher ones on the north; none, however, rise above 25° and only in one point exceed 20°. The elevation of the greater part is under 10°,

The "Mean Temperature" is the simple arithmetical mean of the 9 a.m. and 9 p.m. dry bulb readings, combined with the maximum and minimum for the day.

A new column has been added to the Tables, showing the velocity of the wind in miles for each day, as recorded by a Robinson's Anemometer. This instrument is mounted on a pole in a garden at the back of High Street, and has been read twice daily. The figures in column 10 give the velocity for the twenty-four hours ending 9 p.m.

BOYS WEIGHED MARCH, 1874.

No.	Name.	Age. Years.	Form.	Height. ft.	Height. in.	Inc. in.	Weight. st.	Weight. lb.	Inc. lb.	Head. in.	Inc. in.	Chest. in.	Inc. in.	Arm. in.	Inc. in.	Leg. in.	Inc. in.
173	Acton	15	Up. 4, b.	5	4½	2¾	8	2½	13	22½	½	30½	½	8¾	1	12½	0
510	Alexander	17½	Mod. Up., 2	5	6	5¾	9	8	26½	22	½	31½	1½	9¾	1	13½	¾
483	Alston.....	17	6th Form	5	7½	5¾	9	9½	27½	21¾	¼	32	4	10	1½	13½	1
293	Andrews.....	14½	Mid. 4, b.	4	10½	4¾	6	1½	16	21	0	28	1½	7¼	0	11	1
374	Arkle	15½	Upper 5	5	6¾	5½	9	0	24¾	21¾	½	31	2½	9¾	1	12¾	1
141	Armitage	19	6th Form	5	5	4¾	8	9	26½	22¼	½	31	2¼	9	⅞	12	½
308	Armstrong.....	15½	Upper Shell	5	3½	6¾	8	5¾	21¾	22½	½	30½	2¾	9½	1¼	13¼	1¼
217	Arnold.....	15¾	Mod. M., 2	5	0½	4½	7	8½	25½	22	½	28	½	8	½	13	1½
25	Arrowsmith ...	14½	Mod. M., 2	5	3	5½	8	4	28	22	¼	29¾	2	8½	1¼	12¾	1
580	Askwith	17¼	Low. 5, 2	5	2½	3	7	6¾	14½	22½	½	30	½	8¼	½	12	½
85	Austen	15¾	Up, 4, a	4	11	2¾	6	7	25½	21½	⅞	27¼	½	8¼	1	12	2
181	Baggallay	16¼	Mod. Up., 2	5	11	5¾	11	6	37¾	21¾	0	35	3	11	2	13	1
474	Balfour	17¼	Upper 5	5	10½	6¾	10	6	35	23½	¾	31	¾	9½	¾	13	1
573	Bascom	17½	Mod. Up., 1	5	7½	1	9	9½	12	22½	¼	34	0	9¾	¾	13	0
48	Baskerville.....	15½	Low. 5, 2	5	7	7	9	13	41¼	22¼	½	32	3¼	10	2	14	2
281	Bassett	17¼	Upper Shell	5	8	3¾	10	2	28	23	1½	32	2	9½	1	14½	1½
415	Bellhouse	15	Mod. Low., 1	4	10½	3¼	6	6¾	10¾	21¾	0	27¾	¼	8½	½	11¾	¼
542	Bengough	15	Mod. Low., 1	5	4½	3¼	7	8	9½	22	¼	29¾	1	8¾	¾	12¼	½
517	Bicknell	16¾	Mod. Mid.; 1	5	7¾	6	10	1	23½	21¾	¼	33	4	10¾	1¾	13½	¾
190	Bird.....	15	Low. 5, 1	4	11½	5	6	11½	19	21	¼	29¾	1¾	8¾	1	11½	¾
296	Birdwood	14½	Upper Shell	5	0½	5	6	13½	21	20½	¼	28½	2¾	8	½	12	1½
41	Blackett-Ord ...	17½	6th Form	6	0	7½	10	3	38½	24	1	34	3¾	9½	1	13½	1¾

No.	Name.	Age. Years.	Form.	Height. ft.	Height. in.	Inc. in.	Weight. st.	Weight. lb.	Inc. lb.	Head. in.	Inc. in.	Chest. in.	Inc. in.	Arm. in.	Inc. in.	Leg. in.	Inc. in.
234	Blandy	15¼	Low. 5, 1	5	4¾	5½	9	5¼	38½	22	1	35½	5½	9	1½	13½	2½
295	Bontein	16½	Mod. Up., 1	5	0½	3½	7	9	20½	21¾	⅛	28½	⅛	8½	⅛	12¾	1¼
138	Bowden Smith	15	Low. 5, 1	5	5½	7	8	12	34¾	22⅛	⅛	30½	3	9½	1½	13	1¼
117	Bowers	15¼	Mod. Low, 1	4	11½	4¾	6	9¾	14¾	21	0	29½	0	8	¾	11½	⅛
47	Brodhurst	13½	Up. 4, a	4	6¾	2½	5	13½	12	20½	0	28	1½	7¾	¼	11¼	¼
469	Brown	14	Up. 3	4	7¾	3½	5	7¾	10	21½	0	27½	¼	7½	¼	11½	⅛
470	Brown	12½	Up. 3	4	8½	3½	5	10¾	11¾	21¼	¼	28½	0	7½	¼	11¾	¾
195	Browning	16	Low. 5, 1	5	6	5½	8	12½	26½	21¾	¾	31½	2¾	9½	1¼	13¾	1¾
196	Browning	15	Low. 5, 2	5	2	3	7	3½	14	21½	¾	29	2	8½	1	12½	1¼
454	Bryans	18¼	6th Form	5	9¾	3½	9	11	17¼	22¾	¾	33	3½	9¾	⅛	13¼	¾
72	Bryant	16¾	Low. 5, 2	5	3¾	6½	8	0	31¾	21¼	⅛	31	1½	9	1¾	12	.1
193	Bulley	15½	Upper Shell	5	4½	4½	8	3	26½	22	⅛	30½	3	8½	¼	12	⅛
557	Burness	17¾	Mod. Up., 2	5	8	5½	10	6½	33½	22	⅛	33½	2¾	11	2¾	14	1¼
449	Burnett	17¼	Up. 5	5	11¾	6½	10	12¾	35½	22½	⅛	34	4½	11	2¾	14¼	1½
137	Busk	15¾	Low. 5, 1	5	5½	4¾	8	7¾	25½	21	⅛	30½	0	8¾	¾	13½	1½
416	Butcher	16½	Mod. Up , 1	5	10½	5¾	11	10	30½	22¾	¾	35½	2½	11¾	3½	14½	1¾
8	Butterworth ...	17¾	6th Form	5	6½	5½	10	0½	34	22½	¾	33½	3½	10½	2	13½	1½
524	Cairnes	17½	6th Form	5	7	3	8	10½	22	22½	¾	31½	1½	9½	1½	12¾	1½
285	Carter	14½	Mod. L., 2	5	7¾	5¾	10	1½	32½	21½	0	34	4½	11	1½	13½	1½
512	Chamberlain ...	17¾	6th Form	5	6½	2¾	9	7¾	20½	21	⅛	32	2½	10	1½	13¾	¾
60	Chandler.....	18	6th Form	5	6¾	2¾	9	12¾	32	22	¼	31½	3	9½	¼	13½	1½
140	Chappel	15¾	Upper 5	5	7	4¾	8	7¾	23½	21½	¼	30½	2	8¾	1½	13	1
559	Charley	16	Low. 5, 2	5	8¾	6½	10	1½	32½	22¾	⅛	31	1¾	10½	1½	13¾	1½
29	Cholmeley	13	Mid. 5	4	7½	3¾	5	9½	13½	20½	⅛	28¾	¼	7¾	1	11	1

No.	Name.	Age. Years.	Form.	Height. ft.	Height. in.	Inc. in.	Weight. st.	Weight. lb.	Inc. lb.	Head. in.	Inc. in.	Chest. in.	Inc. in.	Arm. in.	Inc. in.	Leg. in.	Inc. in.
20	Cholmondeley	16	Upper 5	5	2	6½	8	3½	30½	21⅝	½	30½	3½	9½	1½	13	1½
119	Clark	18½	Mid. 5	5	7½	2	10	7½	20½	22½	½	34	3½	10½	1	13½	½
151	Clarke	14½	Mod. M., 2	5	0	3	7	3	17	20½	½	29½	½	8½	½	13	½
129	Coetlogon	15	Low. 4	5	3½	4	6	11½	11½	21½	½	28	1	7½	½	12	½
309	Coetlogon	13	Upper 3	5	0½	3½	6	3	12½	21½	½	28½	1½	8	1	10½	½
18	Coney	17	Low. 5, 1	5	5½	2½	9	1½	14	22½	0	31	1½	10½	1½	13½	½
54	Connor	16½	Mod. Mid., 1	5	2	6	8	2½	28	21½	0	30½	2½	9½	1½	13	1½
53	Connor	16½	Mod. Mid., 2	5	4½	5½	9	0½	28½	21½	½	32½	3	9½	½	13	1½
523	Cooper	17	Mod. Up, 2	5	7½	3	9	7½	23½	21½	½	32½	2½	9½	1½	12½	½
368	Crowe	13	Upper 3	5	1	3	6	10½	9	21½	0	29½	½	8½	½	11	0
569	Curtler	17	6th Form	5	10½	6	9	11	31½	21½	½	32	4	9	1½	13½	1
226	Dalton	15½	Low. 5, 1	5	5	6½	8	9½	32½	22½	1½	29½	2½	9½	1½	13½	1½
76	Daltry	18	6th Form	5	5	3½	9	4½	22½	22½	½	31½	1½	10	1	13½	½
90	Daubeny	14½	Upper 4, b	4	10½	2½	6	7½	16½	20½	½	30	3	8½	1	11½	½
40	Davidson	15½	Mid. 5	5	5	5½	8	12½	29½	22	1	31½	2½	9½	1½	13	1½
402	Davies	17	Low. 5, 2	5	9½	4½	9	10½	26½	21½	½	33	2½	10	2½	12½	½
13	Davies	15½	6th Form	5	3	5½	7	12½	25½	22½	½	28½	1½	8½	1	12	1½
30	Davies	13	Mid. 5	4	11½	3½	6	4½	13½	22½	½	29½	2	8	1	11	1½
397	Dawson	18	6th Form	5	11	4½	10	6	21½	22	½	34	4	10	1	13½	½
171	Denman	18½	6th Form	5	8½	½	9	11½	10	22½	0	33	2½	9	0	13½	½
139	Denman	16	Mod. Mid., 1	5	6	5½	8	11½	31½	22	½	31½	2½	9	1½	12	1½
291	Dennis	17½	6th Form	5	11½	3½	9	9½	19½	22	½	32	3½	8½	½	13	½
331	Dickenson	15	Mod. Mid., 2	4	11½	3	6	7½	11½	21½	½	29½	2½	8	0	11½	½
471	Dixon	15	Low. 3	5	6½	5½	8	11½	27½	22½	½	32	2½	9½	1½	13	1

No.	Name.	Age. Years.	Form.	Height. ft.	Height. in.	Inc. in.	Weight. st.	Weight. lb.	Inc. lb.	Head. in.	Inc. in.	Chest. in.	Inc. in.	Arm. in.	Inc. in.	Leg in.	Inc in.
187	Dods	14½	Mod. Mid., 2	5	1	3½	7	5½	20	21½	¼	29½	½	8½	¼	12¼	1½
276	Douglas	15	Mid. 4 (a)	5	2¾	3¼	7	8½	14½	21¾	0	30	½	9	¼	12¼	¼
496	Dove	19½	6th Form	5	6¾	¼	10	4½	0	22¾	0	33½	¼	11	½	14½	½
459	Drysdale.....	16	Mid. 4 (b)	4	11¼	3¼	6	10¾	15½	21	1	28½	2	8½	¼	12½	½
45	Du Boulay	16¾	Upper 5	5	3¾	5	7	10	18½	20¾	0	30¾	1	9½	¼	12¾	¼
224	Dudgeon	16¾	Low. 5, 1	5	0	5¼	7	2	24½	22	½	29	1¼	8½	¼	12½	1½
59	Ellis	17	6th Form	5	5¼	1½	9	3½	9	22	0	32½	2	9	¼	13¼	0
79	Elton	14¾	Mid. 5	5	6	5½	8	4½	28	22	½	30½	2½	8	¼	12½	1½
401	Evans	15¾	Mod. Low., 1	5	2½	5½	9	3	31¾	22¼	¼	33	4	10	1½	13¼	1¼
17	Eyres	15¾	Upper 5	5	2¼	3	6	11½	7½	21½	¼	29	½	8½	¼	11½	0
12	Falkner	17¾	6th Form	6	4½	1	12	7¾	19	22¾	0	35	3	10	¼	14¼	¼
263	Farquharson ...	16	Up. Shell	5	7½	5½	9	3	30	21½	½	32	3½	9½	1½	12½	1¼
273	Farrar.....	14¾	Low. 5, 1	5	1	4¼	6	7	13¼	20¾	¼	29½	2¾	8	1¼	11¾	1¼
70	Fellowes.....	16¾	Mid. 4 (a)	5	8½	4½	10	1½	34½	22	½	32¾	2½	11	2¼	13¾	1¼
39	Firminger	15½	Up. Shell	5	7	6½	9	8	39½	23	¼	32	3	10	2	14	1½
358	Fiske	17¼	Mid. 5	5	7½	5¾	10	4½	36¼	22¾	½	35¾	5	9¾	1	13½	1
285	Flux.....	15½	Up. 4 (a)	5	6¼	6¼	7	13½	24¾	22¼	¼	29	2½	8¼	1	11½	1¼
174	Foord	16½	Up. Shell	5	4	1½	11	0¾	24¾	23¼	½	38	3½	11¾	1¾	14¾	1¼
311	Forrester	15¾	Mod. Low., 1	5	3½	4	7	7¼	15¾	21¼	¾	30½	1¾	8¾	½	12½	½
300	Foss.....	16¼	Mod. Mid., 1	5	2½	4	8	5	21½	22¼	¾	30¾	1¾	8¾	1	13½	1
403	Fountain.....	19¼	6th Form	5	5¾	5¼	8	12¼	26½	22	1	31½	3	9¼	1½	14	1½
464	Fountain	16½	Mid. 5	5	9½	6	9	5½	32	23¼	1¼	31½	2½	9½	2	13¾	1¾
452	Fountain...	14½	Mid 4 (b)	5	1	4½	6	12½	17	22½	¾	29	2	7¾	¾	12	¾
191	Fowler.....	16½	Upper 5	5	9	4½	12	5½	46	22½	¾	35	5	11½	2	14½	1¼

No.	Name.	Age. Years.	Form.	Height. ft.	Height. in.	Inc. in.	Weight. st.	Weight. lb.	Inc. lb.	Head. in.	Inc. in.	Chest. in.	Inc. in.	Arm. in.	Inc. in.	Leg. in.	Inc. in.
307	Fox	16½	Low 5, 2	5	2½	5½	7	6½	24	22½	½	32½	4½	8½	1½	12½	1½
136	Francis	16½	Up. 4 (a)	5	6	5½	8	5	19½	23½	½	29½	1	9	1	12½	½
550	Froom	14½	Mod. Low., 1	5	1½	3½	7	12½	14½	23	½	29	½	9	½	13½	½
6	Furneaux	16½	6th Form	5	0½	5½	7	11	27	22½	½	29	2½	8½	1	13	1
458	Furnival	15½	Up. Shell	5	5	4½	9	5½	30	22½	½	32	4½	9½	1½	13½	½
227	Garrard	15½	Mod. Low. 2	4	9½	3	6	6½	27½	21½	½	28	½	8½	½	12	½
104	Gayer	19½	6th Form	5	8	1½	9	8½	6½	23	½	32½	½	10½	½	14	½
199	Giles	16½	Mod. Mid., 2	5	4½	5	9	4½	27½	21½	½	32½	1½	10½	1½	14	1
100	Glennie	16½	Low. 5, 2	5	3	3½	7	0	13½	22½	½	29	1½	7½	½	11½	1
411	Glyn	18	Mod. Up., 1	5	9½	2	10	12	19½	23	½	33½	1½	10½	1½	14	1½
184	Glyn	16½	Low. 5, 2	5	6	5½	9	10	36½	22½	½	32½	3	10½	1½	14½	1½
233	Goddard	17	Upper 5	5	5	4½	8	12½	23	22½	½	32	2½	9½	½	13	1
147	Going	16½	Mod. Up., 2	5	3½	3½	7	8½	17½	21½	1	30½	1½	8½	½	12	½
148	Going	14½	Mod. Low., 1	5	1½	3½	6	13½	15	21½	1	30	2	8½	½	11½	½
101	Gordon	17½	Mod. Up., 2	5	6½	5½	9	2½	32	21½	1½	32	2½	9½	1½	12½	½
205	Gordon	16½	Mod. Low., 1	4	8½	5½	5	13½	19½	21	0	28½	2	7½	1	11½	1½
189	Gordon	16	Mod. Mid., 1	5	3	5	8	0	19½	21½	½	32	1½	9	½	12	½
206	Gordon	16½	Mod. Low., 1	4	9½	2½	5	12½	9½	21½	½	27½	½	7½	½	11½	½
363	Grainger	17½	6th Form	5	6	1½	10	6½	11½	22½	½	34	½	11½	1½	13½	½
480	Grant	16	Low. 5, 1	5	8	6½	9	4	30½	21½	½	31	2½	9½	1½	13½	1
247	Grant-Dalton	18	Mid. 5	5	6½	1½	10	6½	19	23	½	35½	3	11½	1½	13½	1
102	Griffith	17½	Upper 5	5	4½	5½	8	4	21½	21½	1	31	3	9½	1½	12½	½
16	Halcomb	16½	Mod. Up., 1	5	6	4	8	6½	22½	22½	½	29½	1½	9	½	12½	1
451	Hall	17½	Low. 5, 2	5	5½	3½	7	10½	13	21½	½	31	1	8½	1	12½	½

No.	Name.	Age. Years.	Form.	Height. ft.	in.	Inc. in.	Weight. st.	lb.	Inc. lb.	Head. in.	Inc. in.	Chest. in.	Inc. in.	Arm. in.	Inc. in.	Leg. in.	Inc. in.
301	Hall	16½	Mod. Mid., 2	5	5½	4½	8	8	19½	21½	½	31	1½	8½	1	13	1
361	Hamilton	15½	Low. 5, 2	4	10	2½	6	10½	13½	21	½	28½	½	9	1½	12½	1
314	Hardy	17½	Mod. Up. 1	5	5	2½	9	6½	17	21½	½	33	2	9½	½	14	1
112	Hardy	15½	Low. 5, 2	5	5½	5½	9	11½	35	22½	½	33½	4½	8½	1	14	1½
322	Harke	15	Mid. 4 (b)	5	3	3½	8	4½	17½	22½	½	31½	½	8½	0	12½	1½
153	Hastings	15½	Mod. Up., 2	5	0½	3½	7	3½	14	22	0	30	0	8½	½	12½	½
154	Hastings	14½	Mod. Low., 2	5	1	3	7	7	13½	21½	½	30	½	8½	½	12½	½
467	Hayes	15½	Mid. 5	5	3	5½	7	11	24½	20½	½	30½	4½	9½	1½	13	1½
494	Hayes	15½	Mod. Low., 2	5	3½	5½	7	12	23½	21	0	29½	1½	9	½	12½	1½
412	Hayward	15½	Mod. Mid., 1	5	2½	4½	8	4½	29½	21½	½	32	2	9	1	13	1½
3	Heaven	18½	6th Form	5	5½	1	10	8	18	22½	½	36	4½	11½	1½	14	1
254	Hill	18	Upper 5th	5	8½	1½	11	1½	16½	22½	½	35	3	10½	½	13½	0
28	Hockin	17½	Low. 5, 1	5	7	3½	9	8	21½	21½	½	34	2	10	1½	13	½
315	Hogg	17	Mid. 5th	5	8	2½	9	7½	26½	21	½	35	5½	10	1½	13½	1½
65	Hooper	16½	Mod. Up., 2	5	7½	4½	9	1½	25½	22½	1	34	3½	10	1½	13	½
534	Hopper	17½	Up. 5th	5	10½	3½	9	8½	19	21½	½	32½	4	9½	1½	12½	½
382	Hunt	18	Mod. Up., 1	5	9	2	10	8½	20½	22½	1½	34	3	10½	1½	13½	1
9	Hunt	15½	Low. 5, 1	5	2½	4½	7	7½	21½	21	½	31½	2½	10	2	12½	1½
58	Ingram	18	6th Form	5	1½	3½	7	6	16	21½	0	29½	0	8½	½	12½	1
19	Ingram	16½	Mod. Mid., 1	5	2½	8½	7	6½	26½	22½	½	29½	1½	8½	1½	11½	½
121	Jackson	16½	Low. 5, 2	5	9	3	12	6½	28½	22½	½	38	2½	12	1	15½	1
316	Jackson	15½	Mod. Low., 2	5	5½	5½	9	1½	50	22½	½	31	½	10	1½	13½	1
426	Jacson	16½	Mod. Mid., 2	5	4	6	8	6½	32½	22½	½	31	4	9	1½	13	1½
450	Jacson	15½	Mod. Low, 2	4	11	4	6	11	18	21½	½	28½	1½	8½	½	12	1½

No.	Name.	Age. Years.	Form.	Height. ft.	in.	Inc. in.	Weight. st.	lb.	Inc. lb.	Head. in.	Inc. in.	Chest. in.	Inc. in.	Arm. in.	Inc. in.	Leg. in.	Inc. in.
306	Johnstone	18 3/4	6th Form	5	6 1/2	1 3/4	10	5 3/4	21 1/2	21 3/4	1/4	36	4 1/2	9 3/4	1/2	14 1/2	1 1/4
24	Kealy	18	6th Form	5	8 1/2	1 1/2	9	8 1/2	14 3/4	22	1/2	34	3 1/2	10 1/4	1 1/4	13	1/2
208	Keith	14	Low., 3	5	1 1/2	3	6	13	4 1/2	22	0	29 1/2	1/2	8 3/4	1/4	12 1/2	1/2
377	Kekewich	17	Mid. 4 (b)	5	8	4	10	3 1/2	33 3/4	22	1/2	34	4 1/2	10 1/2	2	13 1/2	1 1/2
157	Kimber	13	Mod. Low., 2	4	10 1/2	2 1/2	5	13 1/4	10 1/4	21 1/4	1/4	28 1/2	1	7 1/4	1/4	11	0
446	King-Salter ...	15	Mod. Mid., 1	5	0 1/4	3 1/4	6	5 3/4	15	21	0	28	1 1/2	8 1/2	1	11 1/2	1
525	Kirkpatrick ...	15 3/4	Up. 4 (b)	5	4 1/2	5	8	7 1/2	23 1/4	22	1/4	32	3	9	1 1/4	13	1 1/2
456	Kirkpatrick ...	14	Up. Shell	4	10	3	6	6 3/4	14 1/4	22 1/2	1/2	28 3/4	1/4	8 1/2	1 1/2	11 1/4	1/2
96	Kite	19 1/2	6th Form	5	11	1 1/2	10	11	10 1/2	22 1/2	1/2	34	1 1/2	10	1	14	1
142	Kite	15 1/2	Low. 5, 1	5	8	6 1/4	9	10 3/4	36 1/4	22 1/2	1/2	32 1/2	4 1/2	9 1/2	2	13	1
223	Lander.....	17	Mod. Up., 2	5	9	1/2	10	5 3/4	3 1/2	23	3/4	34	1 1/2	11	1	13 3/4	1/4
579	Larkworthy ...	16 1/2	Mod. Up., 2	5	6 1/2	5	8	6 1/2	22 1/4	22 1/4	1/2	31	2	8 1/2	1 1/2	13	1 1/2
442	Laver	15 1/2	Mod. Mid., 1	5	2 1/2	3 1/2	6	13 1/2	12 3/4	21 1/2	1	29	1 1/2	8 1/2	1	12	3/4
355	Lawford	15 1/2	Mod. Up., 2	5	1 1/2	3	6	10 1/2	9 1/2	21	1	28 1/2	3/4	7 1/2	1/4	11 3/4	1/4
505	Laurie.....	15 1/2	Mid. 4 (a)	5	7 1/2	7	9	8	39 1/4	22 1/2	1/2	31 1/2	2 1/2	9 3/4	2	13 1/2	1 3/4
327	Leach	17 1/4	Mod. Up., 1	5	6 3/4	6	10	1	38 1/2	23	3/4	34	4	10 1/2	2	14	1 1/2
269	Leach	16	Mod. Mid., 2	5	6 1/2	5 1/4	9	5 1/2	33 3/4	22 1/2	1	34 1/2	2 3/4	9 3/4	1 1/2	13	1 1/4
255	Lefroy	19 1/2	6th Form	5	9 1/2	3	9	7 1/2	19 1/2	22 1/2	1/2	32	3/4	9 1/2	1/2	13	1
292	Lefroy	17	Mod. Mid., 1	5	6 1/2	6	8	5 1/2	25 1/4	22 3/4	1/2	30	2	8 3/4	1	12 3/4	1 1/2
175	Leveson	14 3/4	Up. Shell	5	4 1/2	6 1/2	8	8	34 1/2	22 1/4	3/4	30	3	9	1 1/4	12 3/4	1 3/4
166	Lewis	16	Up. 4 (b)	5	8	7 1/4	9	10	35	22 1/2	1/2	32 1/2	4	9 3/4	1 3/4	13 1/2	1 1/2
50	Lewis	15 3/4	Mod. Mid., 1	4	9	3 1/4	6	7 3/4	16 1/2	21 3/4	1/4	29	1 1/2	8 1/2	1/2	12	1
250	Lucas	16	Mod. Low., 1	5	4	6 1/2	8	4 1/2	26 1/2	22	1/2	32 1/2	3 1/2	8 3/4	1	12	1 1/4
120	Lucas	16	Mod. Low., 1	5	8 3/4	4 3/4	10	11 3/4	31	22 3/4	1 1/4	33	2	10 1/4	1/2	14 1/2	1

No.	Name.	Age. Years.	Form.	Height. ft.	Height. in.	Inc. in.	Weight. st.	Weight. lb.	Inc. lb.	Head. in.	Inc. in.	Chest. in.	Inc. in.	Arm. in.	Inc. in.	Leg. in.	Inc. in.
562	Mackenzie	16½	Low. 5, 2	5	4½	3¾	8	0½	21½	21½	½	29½	2½	8½	½	13	1½
69	Mackintosh.....	16¾	Mod. Up., 2	5	8½	7¼	9	5¾	35¼	22¼	¾	32¼	2¾	8¾	1¼	13½	1½
94	Mackintosh.....	15½	Up. Shell	5	5¾	4¾	8	8½	24½	22¼	¾	31½	4½	9	1¼	13	1¼
466	Manders	16¼	Mod. Low., 1	5	8	6	9	6	33½	21¾	¾	31¼	2¾	9¼	1¾	12½	¾
565	Marshall	18	6th Form	5	8¾	3¼	10	3	21¾	21¾	½	34½	4¼	9	¾	13½	1
160	May	16½	Mid. 5th	5	7	5¾	9	6	35	21¾	¼	34¼	5	9½	1¼	13½	1¼
82	MacCarogher ...	16¾	Mod. Mid , 2	5	4	5	9	10¾	37¼	22¼	¾	34	5	10	1½	14	1¾
335	Melitus	18	6th Form	5	8½	1¾	9	3½	3¾	22	½	34	3	10	0	13½	½
290	Melville	18½	6th Form	5	6	2¾	8	13½	21¼	22½	0	32	2½	9½	¾	13½	¾
566	Mercer	15½	Up. 4 (a)	5	7¾	7½	9	12¾	45	22¼	¾	34	4¾	9½	1¾	13¾	2¼
289	Mew	18½	Mod. Up., 1	5	9	4	10	13¼	28¾	22½	½	37	4	11½	2¼	14½	1¼
128	Meyrick	17	Mod. Up., 2	5	4	3¾	8	10½	19¼	22	½	31½	2	9½	1¼	13½	1¼
576	Mills	14¾	Up. Shell	5	6½	5½	9	10½	33	22½	1	33½	4	9¾	1¼	13½	1
414	Milner.....	17	6th Form	5	4¾	6	8	3½	23¾	22	½	33	4	8½	¾	13	1½
186	Moore	14¼	Up. Shell	4	9¾	2¾	7	1¼	11½	21¾	½	29	½	9	0	12½	½
211	Murray	17½	Mid. 5th	5	10½	2	11	1¾	20¼	21¾	½	35½	3½	10	¾	14½	1
257	Murray	15¾	Up. 4 (b)	5	4¾	4¼	8	12½	28¾	21¼	½	31	1½	9¾	1½	13¾	1¾
433	Napier.....	17	Mid. 5	5	3½	4¼	8	6¼	21¼	22	½	32½	2½	9¼	1	12¾	1
388	Nelson	16¼	Low 5, 1	5	7½	7½	9	9¼	26¼	21¾	1	34	5	10½	2½	13¼	1½
578	Nelson	14½	Up. 4 (b)	4	8½	3¾	6	8¾	15¼	21	¼	28½	1½	8¾	¾	11½	¼
479	Newby	18	Low. 5, 1	5	8¼	4¼	10	5¾	31½	22¼	0	34¼	3¼	10¼	1¼	13¾	1
260	Nicholson	15¾	Mid. 4 (b)	5	6	4¼	8	10	26½	22¼	¾	33	3	9¼	1¼	13	2
155	Norris	17	6th Form	5	8	6¼	8	9½	30¾	22¼	½	31	3½	9¼	1½	12½	1
182	Oakeley	15	Up. 4 (a)	5	4	4¼	7	10	21½	20¾	½	28½	2	8¾	1	12¾	1¼

No.	Name.	Age. Years.	Form.	Height. ft.	Height. in.	Inc. in.	Weight. st.	Weight. lb.	Inc. lb.	Head. in.	Inc. in.	Chest. in.	Inc. in.	Arm. in.	Inc. in.	Leg. in.	Inc. in.
372	Olivier	17	Up. 5th	5	4½	6	8	7½	28½	22¼	½	33¼	5¼	8¼	1	13	1¼
365	Palmer	14¼	Mod. Low., 2	5	0	4½	6	11	19½	21	½	27½	1	8	1	12	1
56	Paul.....	15	Mod. Low., 2	5	2	3¾	7	1¾	31¼	21	¾	30½	2	8	1½	12¼	¾
333	Peacock	15	Low. 4th	5	2¾	6	7	10¾	29¼	22½	1	30½	2	8¼	¼	12¾	1¾
577	Peele	13½	Low. 3rd	5	1¼	4	7	3	17¾	20¾	0	29¾	2¾	8¼	¼	12	¼
220	Pemberton	17¼	Mod. Up., 1	5	3½	3	7	7½	11¾	21¼	¼	30	½	9	1	12	½
109	Pierson	17½	Up. 5th	5	11½	1¾	11	3¼	12¼	22½	¼	35	3½	10¾	¾	14¾	3½
214	Pompet	18	Mod. Up., 1	5	5¾	2	9	10	10	22½	0	33½	2	10¼	¾	13¾	¼
11	Powles.....	19	6th Form	5	6	2¾	10	6¼	17¾	22½	0	34¼	1½	11	1¼	14	½
465	Preston	15¾	Mod. Mid., 1	5	6½	5¾	9	11¼	29¼	21½	¼	32½	2	10	1	13¾	1¼
453	Probyn	16¼	Up. 4 (a)	5	6½	4	8	8	21	22¼	1	30¾	1¼	9¼	1¼	13½	1
313	Raymond	15	Low. 5, 2	5	8½	7½	9	0	35½	22	¼	30	2½	8¾	1¼	12½	1½
394	Rayner	14½	Mid. 4. (b)	4	10½	3½	6	4½	11½	21	0	29	¼	8	½	11¾	1
346	Rider	16¼	Mod. Mid , 1	5	2	4¾	7	11¾	22	21½	½	32	3¾	9	1½	13	1¾
558	Robertson	15½	Mod. Up., 1	5	4¼	6	8	8	31	22¼	¼	31½	1	10¼	2¼	13¾	1¼
183	Robinson.....	19	6th Form	5	11¼	3¾	10	13½	28½	22¼	¾	32	1¼	9¾	1	13¾	¾
5	Rogers.....	17	Mid. 5th	5	2¾	2¼	8	13¾	16¾	22½	½	34	2¾	9¾	1	13½	¾
132	Rogers	15½	Up. Shell	4	10¼	3¾	6	10	13½	21	¼	29	2	8¼	¾	12¼	1
574	Rooke	14¾	Mid. 4 (a)	5	3¼	5¾	7	0½	21	21¾	¼	28½	1	8¾	¼	11½	¾
575	Rooke	13¾	Mid. 4 (a)	5	1¾	4¾	6	5½	15	20½	0	28	½	7½	0	11¼	¾
424	Rowe	18¼	6th Form	6	0½	2	11	11½	31½	21½	½	37	3¼	12	1¼	15	¾
567	Rowe	17	Low. 5, 1	5	8	5¼	8	10	27½	21½	½	33	4¼	10½	2¼	12¾	¾
423	Savile	16.	Mod. Mid., 1	5	5	4	8	1½	22	20½	½	30	2	8¾	½	12½	1
232	Seamell	14¼	Mid. 4 (a)	4	9¾	3¾	6	8	12	21¼	¼	29½	½	8	0	11½	0

No.	Name.	Age. Years.	Form.	Height. ft.	Height. in.	Inc. in.	Weight. st.	Weight. lb.	Inc. lb.	Head. in.	Inc. in.	Chest. in.	Inc. in.	Arm. in.	Inc. in.	Leg. in.	Inc. in.
131	Shirley	16¾	Mid. 5th	5	6¼	2½	8	12½	20	21	½	31½	2	9¾	1½	13	1
213	Silver	13¼	Up. 4 (a)	5	3½	4¾	7	0	12¼	22½	0	28½	½	7¾	0	11¾	¼
529	Sim	17¼	Low. 5, 1	5	11¾	4	10	5	17	21½	½	35¼	4	10½	1½	13½	1
299	Simpkinson.....	16¾	Up. 5th	5	0¾	2¼	7	6	5	21½	0	29½	1	8½	¼	12½	½
80	Simpson	17¼	Low. 5, 2	5	7¼	6½	8	4	3¾	22	½	33¾	5	8½	1½	11½	1½
357	Smith	19	6th Form	5	11½	0	10	10¼	2½	22½	0	35½	2	10½	½	13¾	¾
33	Smith	15½	Mod. Up., 1	5	8	3	10	11¼	28¼	23½	1	35	3½	11	1¾	14	1¼
359	Smith	17	Up. 5th	5	4	3½	8	10½	23	22½	0	31	3¼	9½	1	13¼	1¾
514	Smith	17	Low. 5, 2	5	7½	4	9	9½	28½	21½	½	33	3	9¼	1	13	1¼
238	Smithe	15½	Low. 5, 2	5	6½	6	8	13¼	35½	22	½	31	3¼	9	1¼	13¾	1½
522	Spencer	16¼	Mod. Mid., 2	4	10¾	3¼	7	5¼	12¼	21¼	½	31½	1	9½	1	12½	¾
159	Square.....	17½	Low. 5, 2	5	7¼	3½	11	4½	31¾	23½	1	36	5	11¾	2	14½	1
376	Steel	17½	Low. 5, 2	5	7	3¼	10	13¼	29¼	22½	¾	33½	3¼	10½	1¼	15	1¼
477	Steele	17	Low. 5, 1	5	5¼	3½	9	7¼	33¼	21½	¾	34	4¼	9¾	1¾	13	1¼
448	Stephenson ...	17	Up. 4 (a)	5	6¼	5	9	1¼	27¼	22¼	¾	31½	3½	9	¾	13¼	½
356	Stevens	12	Low. Shell	4	11¾	4	6	6¼	13½	22¼	¼	29½	1½	7¾	¼	12½	½
158	Sutton	13	Low. 3rd	4	10½	2½	7	0½	23¼	21¾	¼	29¾	¾	9	1	12½	¼
26	Tait	13½	Up. Shell	5	2	4¼	7	8½	17¾	22½	1	30	2	8¼	¾	12½	1
89	Tanner.....	16½	Mod. Up., 1	5	4¾	5	10	7½	37¾	23	½	30½	1¼	9¼	¾	12¾	1
163	Tatham	17¼	Low. 5, 1	5	7¾	1½	10	2¼	11½	22½	¾	33	1¼	10	¾	14	¼
91	Tatham	15½	Up. Shell	5	7½	5¾	9	7½	24¼	22¾	1¼	33	2	9¼	½	12¾	1½
67	Tatham	13½	Mid. 4 (b)	5	0¼	3½	7	11½	18½	22½	½	30½	¾	9¼	¾	12¼	¾
472	Templer	18	Mod. Up., 2	5	8½	5	10	9¾	36½	21¾	¾	34½	3½	10¾	1¾	14	1¼
95	Thatcher	17¼	Mid. 5th	5	8¾	3½	11	0¼	28¼	21¾	½	34	4¼	10	1¼	14	¾

No.	Name.	Age. Years.	Form.	Height. ft.	Height. in.	Inc. in.	Weight. st.	Weight. lb.	Inc. lb.	Head. in.	Inc. in.	Chest. in.	Inc. in.	Arm. in.	Inc. in.	Leg. in.	Inc. in.
198	Thompson	17	Up. 5th	5	8	3½	11	5	41½	22½	1	35	4½	10½	1½	13¾	1
122	Thomson	18	Up. 5th	5	9½	3½	11	1½	32½	22¾	1	36½	5	10	1½	14½	1½
367	Thomson	15½	6th Form	5	5	5½	9	5	22½	22	½	32	2½	9	1	14¼	1¼
330	Thornton.....	17½	6th Form	5	7½	1½	9	7½	24	22½	½	34	5½	9½	¾	13½	1¼
49	Thring.....	15	Up. Shell	4	11½	3½	7	1	15½	21¾	¾	29½	1½	9	1¼	12¼	1¼
312	Tillard	17¾	6th Form	5	9	¾	11	5	21½	23¼	½	36	4½	11¼	1	13¾	¾
407	Todd	17	Low. 5, 1	5	9½	3½	10	2	20½	22¾	0	32½	1¼	10	1¾	13½	0
484	Todd	16	Mid. 4 (b)	5	7¾	5½	10	4	30½	22½	½	35	3¾	9½	1	14	¾
231	Tombe	16	Up. 4 (a)	5	7	5¼	8	5¼	27	22	1	33½	4½	8½	1	13	1½
113	Topham	16	Mod. Mid., 2	5	9	5¾	9	12¾	38½	22	1	32½	3	9½	1¼	12¾	1¼
219	Tottenham	17¼	Up. Shell	5	7¼	4¾	9	8¼	25¾	23	½	34¾	2¼	9½	1¼	12¼	¼
560	Turner.....	15¼	Mod. Low., 1	4	11½	3	6	13½	11¼	22¼	¼	30	2¼	8½	¼	12¼	½
116	Urqnhart	16¾	Mod. Mid., 1	5	6½	3½	9	2	22¼	22¼	½	33¾	3¾	9½	¾	13	¾
564	Vans-Agnew ...	16½	Mid. 5th	5	7	6½	8	2	28	22½	⅞	31	4¾	8½	1¼	12¾	1½
2	Vassall	15½	Up. 5th	5	8¼	5½	12	0½	43	23¼	¾	35½	4	11¼	2	15½	1½
97	Vigne	17	Up. 4 (a)	5	5½	2	9	7	16½	22	¼	32	½	10	1	13½	1
32	Walters	16¾	Up. 5th	5	9	2½	8	6¾	3¾	22¼	¼	32	1¼	9	¾	12¾	0
497	Ward	17½	Low. 5, 1	5	3¾	3½	8	4¾	15½	22½	½	32	1¼	9¾	1¼	12½	¾
563	Ward	16½	Mod. Mid , 1	5	4	6	7	10½	13¾	21¾	0	28½	½	8½	½	12½	¾
87	Watson	17¼	Up. 5th	5	5¾	4	8	10¾	23¾	21½	¾	31½	2¼	9¼	1	13¾	1¼
547	Watson	17¼	Mod. Up., 1	5	6	5	8	13½	26¾	22	½	33	1½	9½	1¼	13	1
248	Weldon	15	Mid. 4 (a)	4	11	4	7	2½	18½	21½	1	28½	0	9	1¼	12	½
428	Weston	15¼	Up. Shell	5	9½	6	10	3¾	35¾	22¾	½	31½	2½	9¼	1½	14	1¼
114	White	13½	Low. 5, 2	4	9½	3	6	11½	15¾	21¼	¼	27¾	1½	8¾	½	12¾	1

No.	Name.	Age. Years.	Form.	Height. ft.	Height. in.	Inc. in.	Weight. st.	Weight. lb.	Inc. lb.	Head. in.	Inc. in.	Chest. in.	Inc. in.	Arm. in.	Inc. in.	Leg. in.	Inc. in.
261	Whiting	17¼	Low. 5, 1	5	8¾	4	10	13½	29	22	½	34¾	3½	10½	1½	13¾	¾
87	Wilkinson	15½	Up. 4 (a)	5	2	5½	7	8½	26½	22	½	30	2	9	1½	12½	1½
404	Williams	17½	Up. 5th	5	6	4½	10	6	33½	23½	¾	34½	2¾	10½	2	14½	1½
115	Wilson	16¾	Up. 5th	5	8	5½	11	3½	44½	22½	1	35	5	10¾	2½	15	2½
305	Wilson	16½	Mid. 5th	5	2½	3¾	7	3	12½	22	½	30	2½	8¾	¾	12	1
66	Wollaston	17	Up. 4 (a)	5	8½	2½	10	1½	19¾	22½	½	33	2	9½	½	13½	½
515	Womersley	17	Mod. Mid., 2	5	5¾	1½	10	0½	16½	22	½	32½	1¾	10½	¾	14½	0
509	Womersley	15¾	Mod. Low., 1	5	3	6¾	9	1	38¾	22½	½	31	2½	9½	1½	14½	2
457	Wood	16	Mid. 4 (a)	5	4¾	6¾	8	6	34½	21½	½	29¾	2¾	10	2	13½	2
347	Woolley	15½	Mod. Mid., 2	5	6	7	9	0	38½	22¾	¾	31	3	9	2½	13½	2
496	Worship	17¾	Up. 5th	5	6¾	4½	9	7¾	22¾	21½	½	33	3	9½	1¾	13½	1
443	Yale	17	Mod. Mid., 2	5	4½	3¾	9	6½	29½	22½	½	33	3¾	10	1½	13½	1½
325	Yeatman	17½	Mid. 5th	5	1½	4	6	11½	14¾	21½	½	31½	2¾	8½	1½	12	1½
462	Yetts	15	Low. 4th	5	6½	7½	9	6¾	37½	21½	0	32½	2½	9¾	1	14½	1½

BOYS WEIGHED JUNE 30TH, 1874.

No.	Name.	Age. Years.	Form.	Height. ft.	Height. in.	Inc. in.	Weight. st.	Weight. lb.	Inc. lb.	Head. in.	Inc. in.	Chest. in.	Inc. in.	Arm. in.	Inc. in.	Leg. in.	Inc. in.
320	Atkinson	16	Up. 4 (a)	5	7½	6¼	9	6	36¼	22½	¾	30½	2½	9¾	1¾	13¼	1¾
126	Buckley	15¾	Mid. 4 (b)	5	4	4¾	8	13½	25½	22	0	31	2	9½	¾	14	1½
519	Callender	15½	Mod. Mid., 2	5	3	4	7	1½	17¼	21¾	¼	28½	2	8	½	11¾	¾
229	Dickens	14	M. 4 (a)	4	10	2½	6	0	12½	21	0	28½	3	7½	¾	11	½
410	Duncan	15	Up. Shell	5	4	3¾	8	6	20¼	22¼	¼	31	2¼	10	¾	12	½
510	Fairlie	16	Mod. Up., 2	5	5½	4	8	3	20½	21¼	¼	29	1½	8¾	1¼	12½	¾
351	Hume	16¾	Mod. Up., 1	5	9½	3¾	10	0½	23	22½	1¼	32	2	9½	⅝	13¼	1¼
352	Hume	15¾	Mod. Up., 1	5	8	4½	11	2	34¾	23	½	34½	3	11	2	15	1½
475	Ivatt	17¼	Mod. Up., 2	5	5	4	8	7¾	15½	22¼	¼	31	1½	9½	1	14	1
235	Longton	15¾	Up. 4 (b)	5	5¼	6¼	8	11¾	28	22	½	31	2	9½	1¼	13¼	1¼
364	Master	16¼	Mod. Up., 2	5	5½	5¼	8	10¼	30	21¾	¼	30¼	1¾	9	1¼	13	1½
237	Melitus	16	Up. 4 (b)	4	11½	4¼	7	1½	20¾	20½	0	30	3¾	8¾	1	12¾	1¼
294	Pritchard	14½	Mid. 4 (b)	5	4¾	5½	8	9	28¾	22½	¼	30½	2	9	1¾	14	1½
243	Rushdall	15¾	Up. Shell	5	7½	4¾	9	0¼	24¼	21½	½	29½	½	9¼	¾	13	1
489	Tanner	13	Up. 3rd	4	9½	2½	6	5¾	15	22	½	26½	½	8¼	¾	12	¾
321	Twigg	12¾	Low. 4th	4	8½	2¾	6	1	4½	22½	0	27	0	8½	¼	11	¼
500	Vickers	14¾	Mod. Up., 1	5	1¼	4¾	6	7½	18½	22½	¼	27	2	7½	¾	11¾	1½

57 BOYS ADMITTED JANUARY 28TH, 1876.

No.	Name.	Form.	House.	Born & Age.	Height. ft. in.	Weight. st. lbs.	Circumference of head. in.	chest. in.	arm. in.	leg. in.	Place of birth.
36	Adams, H.	Up. 4, b	G.H.D.	Oct. 61—14½	5 4½	8 4½	22	30	9½	12½	Berks.
393	Ayris, H. C.	Mod. L., 2	A.H.B.	Mar. 61—14¾	4 11¾	8 0	21¾	32½	9	11½	Norwich.
268	Bagge, G.	Low. 3	H.R.	Aug. 63—12½	4 9	5 9	20½	26	7	11	Cork.
192	Bedwell	Mid. 4, b	T.O.H.	Oct. 61—14½	5 1¾	7 10¾	22	31½	9¾	13	London.
277	Bell, R. M.	Up. 3	A.H.B.	July 63—12½	4 5¾	4 13½	21	26¾	7½	10½	Wilts.
570	Bellhouse, V.	Low. Sh.	W.E.M.	Mar. 63—12¾	4 7½	4 2½	20½	25½	7½	10	Manchester.
345	Benson, R. A.	Up. 3	W.F.	Jan. 63—13	4 6¾	5 6¾	22	28	7½	11	Devon.
548	Bent, W. B.	Low. 3	W.E.M.	Mar. 63—12¾	4 8½	5 11½	20½	27	7½	11	London.
384	Bell, W. E.	2nd F.	W.F.	Nov. 63—12½	4 10½	6 7½	21	28	8	11½	Surrey.
460	Buckland, A. V.	2nd F.	F.E.T.	Oct. 63—12½	4 11½	6 10½	21½	27½	8¾	11½	Surrey.
419	Chase, R. G.	Mid. 4, b	J.B.G.	Nov. 61—14½	4 11½	7 5	22	30	8	13	N.W.P, India.
161	Clark, H. A.	Up. 3	H.R.	Ap. 63—12¾	4 9½	6 0	20½	27½	7½	11	Wilts.
395	Clarkson, W. C.	Mid. 4, b	A.H.B.	Aug. 61—14½	4 6½	5 5¾	20	27	7¾	11½	Middlesex.
176	Coates, J. A.	Up. 3	H.R.	July 62—13½	4 7¾	5 9½	21¾	26½	7¾	11	Glo'stershire.
511	Colley, L. E.	2nd F.	W.E.M.	Nov. 63—12½	4 6½	4 8¾	21	25	6½	9½	Sheffield.
323	Crooke, T. L.	Up. 4, b	A.H.B.	Mar. 61—14¾	5 0¾	6 11½	21½	28½	8½	11½	Sheffield.
279	Crookenden, H. M.	Mod. L, 2	C.W.T.	Jan. 62—14	5 2	7 11½	21½	30½	9½	12½	Kent.
538	Davis, W. L.	Low. 4	W.E.M.	Aug. 61—14½	5 1½	7 1½	21	30	8	11½	London.
106	Dibb, A. W.	Upper 4, a	G.H.D.	Aug. 61—14½	4 11½	6 8½	19¾	29	7½	11½	S. India.
271	Dobie, D.	Mid. 4, a	G.H.D.	Aug. 61—14½	4 8½	5 8½	21½	27	7½	10	Cheshire.
156	Dumbleton, L. G.	Mod. L., 2	G.H.D.	May 61—14½	4 10¾	6 9½	21¾	28½	7¾	11½	Cape G. Hope.
93	Ellis, W. W.	Mid. 4, a	T.O.H.	Nov. 61—14	5 3½	7 6½	22½	30½	7½	12¾	Wilts.

No.	Name.	Form.	House.	Born & Age.	Height. ft. in.	Weight. st. lbs.	Circumference of head. in.	chest. in.	arm. in.	leg. in.	Place of birth.
391	Ellison, G. F.	Up. Sh.	A.H.B.	Aug. 61—14¼	4 10¾	6 12½	22	29	9	12	Bucks.
360	Fountain, A.	Mid. 4, b	J.B.G.	Feb. 62—13¾	Weighed and measured, March, 1874.						Middlesex.
267	Gale, J. S.	Low. 3	H.R.	Mar. 63—12¾	4 9½	5 9¾	20½	27½	7	11	Somersetshire.
329	Hardy, J. F. L.	Up. Sh.	T.A.P.	Dec. 60—15	5 5¾	9 4¾	23½	31½	9¾	13¾	Glo'stershire.
297	Henniker, J. G.	Up. 4, a	C.W.T.	Jan. 62—14	5 6	9 5¼	22¾	33	9¾	13¾	Northumberland.
75	Highton, H. P.	Low. 3	H.R.	Aug. 65—10¼	4 5½	4 13¾	21	25½	7½	10¼	Somersetshire.
209	Hill, R. E.	Low. 4	W.M.F.	Aug. 61—14¼	5 0	6 7½	21¾	27	7¾	11½	Somersetshire.
210	Hill, F. J.	Up. 3	H.R.	Oct. 62—13¼	5 0½	6 12½	22	30	8½	11½	Somersetshire.
118	Hillman, A. E. E.	Up. 3	H.R.	Aug. 62—13½	4 11½	6 2¾	21	27½	7½	10½	London.
55	Hitchcock, R. A.	Up. 4, b	T.O.H.	Nov. 61—14	5 3½	8 2¾	22	31	9	12	Durham.
265	Laidlay, W. R.	Up. 4, a	W.M.F.	Nov. 62—13	4 9¾	5 10¾	21½	28	7	10½	Surrey.
521	Leaf, H. M.	Low. 4	W.E.M.	Oct. 62—13¼	4 10	5 9¾	21¼	28½	8	10¼	Yorkshire.
491	Little, C. H.	Low. 4	F.E.T.	Sep. 62—13¼	4 7¾	6 2½	21½	29	8½	11¾	London.
549	Mildmay, C. B. St. J.	Mod. U., 2	W.E.M.	Jan. 61—15	5 6¼	8 13½	22½	31½	8¾	13¼	London.
438	Porter, R. M.	Mod. M., 2	F.E.T.	May 61—14½	4 11¼	6 7¼	20½	28	8¼	12	Surrey.
447	Payne, H. R. A.	Mid. 4, b	F.E.T.	Aug. 61—14¼	5 0½	6 11½	21½	28½	7½	11½	Somersetshire.
555	Pritchett, E. H.	Mid. 4, b	F.E.T.	July 61—14½	4 10	6 2	21½	28	7½	11	Middlesex.
62	Pulling, H. G.	Low. 5, 2	W.M.F.	May 62—13½	4 10	6 9	21¾	29	8	11¾	Herefordshire.
287	Purvis, R. B.	Mod. L., 1	W.F.	Nov. 62—13	4 9½	6 7¼	21	28	8	12	Hampshire.
408	Rayner, H.	Up. 4, a	J.B.G.	Nov. 60—15	Absent.						Liverpool.
262	Rendel, A. B.	Mid. 4, a	T.A.P.	July 62—13½	4 11¾	6 11¼	21¾	27¾	8	11¾	Surrey.
236	Smithe, B. G.	Mid. 4, a	H.R.	Dec. 62—13	4 6	5 9	21	26	7½	11¼	Pau.
499	Thompson, R. B.	Mid. 4, a	F.E.T.	Dec. 61—14	4 10¾	6 13¾	21½	29½	8½	12	Westmoreland.

No.	Name.	Form.	House.	Born & Age.	Height. ft. in.	Weight. st. lbs.	Circumference of head. in.	chest. in.	arm. in.	leg. in.	Place of birth.
168	Thompson, F.	Low. 2	H.R.	Ap. 63—12¾	4 8½	5 7¾	20½	26¾	7¾	10½	Suffolk.
202	Thring, L. C. R.	Low. 4	H.R.	Sep. 62—13¼	4 8	6 1¾	21	27	8¼	11	Rutland.
540	Tracy, W. M.	Mid. 4, b	W.E.M.	Feb. 62—13¾	4 11	6 7½	20½	27½	8	12¼	Cawnpore.
413	Trotter, J. C.	Low. 3	J.B.G.	Ap. 63—12¾	4 7¼	6 5¼	22¼	28¾	7¾	11¾	Durham.
541	Turner, F. S.	2nd F.	W.E.M.	Aug. 63—12¼	4 9¼	6 10	21¾	27¾	8½	11¾	Middlesex.
170	Valintine, T. H. A.	2nd F.	H.R.	Aug. 65—10¼	4 3¾	5 0½	21	26	7¼	11	Hampshire.
468	Vian, W. C.	Mod. L., 1	F.E.T.	Oct. 61—14¼	5 2¼	8 9¾	22¾	30½	9¾	13¼	Kent.
539	Vickers, E.	Low. 3	W.E.M.	May 63—12½	4 11	6 9¾	20¾	27	8¼	11½	Sheffield.
344	Waddilove, E. G.	Up. 3	T.A.P.	Sep. 62—13¼	5 1½	6 2¾	21¼	26¼	7¼	11¼	London.
15	Wade, E. R.	Low. 5, 2	H.B.H.	Dec. 61—14	5 0½	6 10	21	28½	8	11½	Kerry.
165	Whitaker, R. H.	Mid. 4, a	F.E.T.	Oct. 61—14¼	4 9½	6 4½	21½	28½	8	11¼	Yorkshire.
366	Windeler, F. B.	Mod. M., 2	A.H.B.	Ap. 63—12¾	4 7	5 9½	21½	26¼	7¾	11	Surrey.

26 BOYS ADMITTED MAY 3RD, 1876.

No.	Name.	Form.	House.	Born & Age.	Height. ft. in.	Weight. st. lbs.	Circumference of head. in.	chest. in.	arm. in.	leg. in.	Place of birth.
264	Callendar, W. J.	Low. 4	H.R.	Aug. 64—11½	4 7	5 8½	21¾	27	8	11	Glo'stershire.
215	Coates, W. H.	2nd F.	H.R.	Ap. 65—11	4 4½	5 13¾	21	24½	7	10½	Hampshire.
31	Davies, M. L.	Mid. 4, a	H.R.	Sep. 64—11½	4 7½	5 11½	21½	27	8	10½	Wor'stershire.
289	D'Urban, W. H. M.	Mod. L., 2	T.A.P.	Aug. 64—11½	4 6	4 11	21½	25	6½	11	Devon.
119	Dyson, I. P. H.	Mid. 4, b	W.M.F.	July 62—13¾	4 9½	6 9½	20½	28½	9	12	Kishnagar, N.I.
546	Ewart, J. S.	Up. 4, a	F.E.T.	Mar. 61—15	5 3	7 11½	21½	30½	8½	11¾	Staffordshire.
208	Feetham, E.	Up. 3	T.A.P.	June 63—12¾	4 10	5 4½	21½	25	7½	10¾	Wilts.
300	Fisher, J.	Low. 4	W.M.	Mar. 62—14	5 1½	6 12½	21½	29¾	8	11½	India.
443	Fletcher, E.	Low. 4	W.F.	Jan. 63—11¼	4 9½	5 8	21¾	25	7½	11¼	Lancashire.
471	Fox, T. H.	Low. 3	W.F.	June 63—12¾	4 5½	5 8	21½	28	8	11	Somerset.
177	Hardy, R.	2nd F.	H.R.	Ap. 65—11	4 6½	6 2¾	22	28½	8¼	12¼	Middlesex.
61	Hartley, J. B.	Mid. 4, a	G.H.D.	July 61—14¾	5 4½	8 8½	21	29	9¼	13½	Suffolk.
219	Hookin, J. M.	2nd F.	H.R.	May 64—11¾	4 7¾	5 7¼	21½	25½	7	10¾	Cornwall.
335	Impey, L.	Low. 4	W.M.	June 62—13¾	5 1¼	6 10½	21½	27½	8¾	11½	East Indies.
249	Jones, C. E. A.	Mid. 4, b	H.B.H.	Ap. 62—14	4 10	6 12½	22	29¾	9½	12	Glamorganshire.
65	Macready, C. F. N.	Up. 3	H.R.	May 62—13¾	5 5¼	8 5½	21¾	29	9½	13½	Glo'stershire.
256	Pigott, T. V.	Mod. L., 2	H.R.	Jan. 63—13¼	4 9½	6 4½	21½	26½	8¾	12	Kent.
515	Priestley, J. C.	Mid. 4, a	W.E.M.	Jan. 62—14¼	5 0½	6 8	21	29	7½	11½	London.
261	Ravenhill, H. T.	Up. 4, b	H.B.	Sep. 62—13½	5 1¾	6 12	21½	28½	8¼	11¾	Essex.
510	Rolleston, H. D.	Low. 4	W.E.M.	June 62—13¾	5 0¾	6 6¾	21½	27¾	7½	12	Oxford.
381	Sinclair, J. L.	2nd F.	W.M.	Ap. 65—11	4 6½	5 10½	21	25	8¼	11½	Londonderry.

No.	Name.	Form.	House.	Born & Age.	Height. ft. in.	Weight. st. lbs.	Circumference of head. in.	chest. in.	arm. in.	leg. in.	Place of birth.
94	Sitwell, F. A.	Up. 3	H.R.	Sep. 62—13½	4 10	6 2½	21½	27½	7½	11¼	London.
169	Street, F.	Low. 3	H.R.	June 64—11¾	4 9¾	5 13	21¾	28	7¾	11½	Burmah.
91	Tatham, C. E.	Low. 3	H.R.	Aug. 64—11½	4 6½	7 9½	22	29	7¾	11	Norfolk.
128	Tothill, E. R.	Mid. 4 (b)	H.R.	Aug. 61—14½	4 10½	6 0	21½	26½	7	11	Somersetshire.
440	Wynyard, W. B. A.	Low. 4	W.F.	Oct. 26—15½	4 10½	6 5	22	26½	7¼	11¼	East Indies.

BIRDS OF MARLBOROUGH.

APPENDIX.

It is just eight years now since the "Birds of Marlborough" was first written, six since it was first published. During these years several new birds, unnoticed in that book, have made their appearance in our district. Doubtless many more would have been noticed but for the passing of the gun license, and Wild Birds Preservation Acts. Many a rare bird escapes now which would have been ruthlessly butchered, stuffed, and would perhaps have found its way into the museum of our Natural History Society, if it had come among us in the days in which it was unprotected by this "minute legislation." But while we have even reason to congratulate ourselves on the small number of additions to our list, as affording proof of the wholesome working of these acts, we must yet remember that this should really be no reason for the decrease in our notices of birds. Now that we may no longer use our guns to kill them, there are all the more birds for our eyes to see; and, then, the notices we get with our eyes are so much more useful than those we get with our guns. It is a matter of real regret to me that I have so little actual observation of living birds to record.

As I am now so seldom in Marlborough, it should perhaps have fallen on some one else to record these additions, but when I was asked to do so, I gladly undertook the task, as I had long wished for an opportunity of noticing a few mistakes made in my original book; especially those mistakes pointed out to me in various kindly criticisms.

Prof. Alfred Newton pointed out an error on p. 24, and another on p. 28 of my book. In the first of these places I assumed that the name Titmouse was due to the mouse-like appearance and fur-like feathers of the Longtailed Tit; but the professor says 'that the "mouse" in "Titmouse" has nothing to do with *mouse* = *maus* (Lat. mus), but is cognate with *meise*, Fr. *mésange* (Parus), the prefix signifying *little*, as in *Titlark*.' While admitting the truth of this, it yet appears to me that the mouse-like appearance of the bird may have caused the corruption of *meise* into *mouse*. Again on p. 28 I should have translated the German work *Finke* not *Finch*, but *Bunting*.

The late Mr. Edward Newman reviewed my book in the "Zoologist," and was, I believe, also the writer of the notice which appeared in the "Field." He pointed out, somewhat querulously, that the classification which I had adopted in my book, and by which the "Residents," "Summer Visitors," "Rare

and Occasional Visitors," &c., were separated was suggested by him, and not by Mr. Clarke Kennedy, to whom he thought I had attributed it. I have since found out that the idea was really first suggested by Mr. Newman, but it is none the less a fact that I adopted it from Mr. Kennedy. Moreover, I now think that the plan is useless, and only serves to confuse the reader. If it is adopted in a history of the birds of a district, it should at least be accompanied by a synoptic list of the whole of the birds in their proper order. I now hold this view so strongly that I take the present opportunity to give such a list, in which will be found the names of all the birds which we know to have occurred within a district extending for eight miles round Marlborough; the residents, visitors, &c., are distinguished by different letters, thus—
Sparrow Hawk—Accipiter nisus. R. (*i.e.* resident).

To return to my critcs:—In the "Zoologist" it was written that I was mistaken in quoting *Sea-woodcock* as a local name of the *Little Grebe* or *Dabchick*. In my book I had detailed the story of the way in which the name originated, and I need now only repeat that I still believe both story and name to be entirely accurate.

Two criticisms by Mr. Gauntlet, head keeper of the Marquis of Ailesbury, are also worth notice. He objects to my speaking of the white Pheasant (p. 47) as a *species*. Of course I ought to have written *variety* in a book on Natural History, but I accidentally used the word *species* in an indefinite, logical sense, rather than as a fixed scientific term. He also remarks that he thinks I must be in error in saying that I found a pheasant's nest on the 3rd of March; he adds, "the earliest I have ever known a pheasant to lay is a very early one, on the 27th March, and that was quite in the South of England. We consider it very early here (*i.e.* Savernake) by the 12th of April." Mine is certainly an abnormally early instance, but it is nevertheless true that I found a pheasant's nest in the top of a pollard willow, on the 3rd of March, 1866. It was on a tree over-hanging the river Avon, where it runs nearest to Vespasian's Camp, between Stonehenge and Amesbury. In the same letter he gives some information as to the breeding of Herons in the Forest, which will be found inserted in its proper place in the following pages.

Finally, before leaving this subject, I must thank my critics, thank the School, and many others, for the kind reception they gave to the "Birds of Marlborough."

A complete list of the birds found in the neighbourhood of Marlborough, with notes on such as have been seen for the first time during the last six years, chiefly from the memoranda of the Rev. T. A. Preston. Residents, Summer Visitors, Winter Visitors, Spring and Autumn Visitors, and Rare

and Occasional Visitors are distinguished by the letters R, S, W, S A, and R O, respectively. The species new to the list are the Hen Harrier, Whimbrel, Spotted Crake, Pin-tailed Duck, Scaup Duck, Common Scoter, Shag, Little Gull; they are distinguished thus *.

White-tailed Eagle—Haliætus albicilla. R.O.

Peregrine—Falco peregrinus. R.O.

November 5th, 1870, a specimen of this bird was caught near the Devil's Den, by William Brown. This is as far as I know only the second instance of its occurrence within our district.

Hobby—Falco subbuteo. R.

I now mark this as a resident, though a scarce one. I originally placed it among the occasional visitors, but a few of them probably reside on our downs. In September, 1872, an unusual variety of this species was caught within the College grounds by H. A. Evans, Esq; its wing had been badly borken. This bird which is now in our museum, was exhibited at a meeting of our Natual History Society, held on the 13th of September in the same year. I hear that about the same time one was shot at Rockley, and another at Pewsey.

Merlin—Falco Æsalon. R.

With the last species, and for the same reasons, I now transfer this from the occasional visitors to the residents.

One was shot at Ramsbury on the 5th of January, 1875.

Kestrel—F. tinnunculus. R.

Sparrow Hawk—Accipitor nisus. R.

Kite—Milvus vulgaris. R.O.

Rough-legged Buzzard—Buteo lagopus R.O.

* *Hen Harrier*—Circus cyaneus. R.O.

I have seen a specimen of this bird, which was shot in Savernake Forest, in 1862. Six are said to have been seen together on Clench Common about 1864; one of them was procured, and was stuffed by Parker of this town.

Long-eared Owl—Otus vulgaris. R.

Short-eared Owl—O. brachyotus. A.S.

Barn Owl—Strix flammea. R.

Tawny Owl—Syrnium stridula. R.

In my previous list I quoted the 3rd of March as an early date for the breeding of this owl. Since then, two yet earlier dates have been recorded in the reports of our society. On March the first, 1870, two eggs were found; and on the 11th of the same month and year

six eggs, partially hatched-set, were found. The number, however, in this latter case seems suspiciously large.

Grey Shrike—Lanius excubitor. R.O.
Red-backed Shrike—Lanius collurio. S.
Spotted Flycatcher—Muscicapa grisecla. S.
Missel Thrush—Turdus viscivorus. R.
Song Thrush—T. musicus. R.
Fieldfare—T. pilaris. W.
Redwing—T. iliacus. W.
Blackbird—T. merula. R.
Ring ouzel—T. torquatus. S.A.
Hedge Sparrow—Accentor modularis. R.
Redbreast—Erythaca rubecula. R.
Redstart—Phœnicura ruticilla. S.
Stonechat—Saxicola rubicola. S.
Whinchat—S. rubetra. S.
Wheatear—S. œnanthe. S.
Grasshopper Warbler—Salicaria locustella. S.
Sedge Warbler—S. phragmitis. S.
Reed Warbler—S. arundinacea. S.
Nightingale—Philomela luscinia. R.O.
Blackcap—Curruca atricapilla. S.
Garden Warbler—C. hortensis S.
Whitethroat—C. cinerea. S.
Lesser Whitethroat—C. sylviella. S.
Wood Warbler—Sylvia sylvicola. S.
Willow Warbler—S. trochilus. S.
Chiffchaff—S. rufa. S.
Golden-crested Wren—Regulus cristatus. R.
Great Tit—Parus major. R.
Blue Tit—P. cœruleus. R.
Cole Tit—Parus ater. R.
Marsh Tit—P. palustris. R.
Long-tailed Tit—P. caudatus R.
Pied Wagtail—Motacilla Yarrelii. R.
Grey Wagtail—M. boarula. R.O.
Ray's Wagtail—M. Rayi. S.
Tree Pipit—Anthus arboreus. S.
Meadow Pipit—A. pratensis. R.
Skylark—Alauda arvensis. R.
Woodlark—A. arborea. R.O.

I have now actually seen this bird in the neighbourhood of Marlborough, and therefore no longer hesitate to place it in our list.

Bunting—Emberiza miliaria. R.

Black-headed Bunting—E. schœniclus. R.

Yellow Bunting—E. citrinella. R.

Chaffinch—Fringilla cœlebs. R.

Mountain Finch—F. montifringilla. W.

During the first week of February, 1873, large numbers of Bramblings arrived and remained near the town. In St. Margarets as many as 35 (?) were obtained at a single shot.

House Sparrow—Passer domesticus R.

I believe the true Tree Sparrow (*P. montanus*) is not a Marlborough bird.

Greenfinch— Coccothraustes chloris. R.

Hawfinch—C. vulgaris. R.O.

Goldfinch—Carduelis elegans. R.

Linnet—Linota cannabina. R.

Lesser Redpole—L. linaria. R.O.

Bullfinch—Pyrrhula vulgaris. R.

Crossbill—Loxia curvirostra. R.O.

Starling—Stunus vulgaris R.

Raven—Corvus corax. R.O.

This bird is now probably extinct as a Marlborough species.

Crow—C. corone. R.

Hooded Crow—C. cornix. R.O.

Rook—C. frugilegus. R.

Jackdaw—C. monedula R.

Magpie—P. caudata. R.

Jay—Garrulus glandarius. R.

Green Woodpecker—Picus viridis R.

Great-spotted Woodpecker—P. major. R.

In my last list I excluded this, and the next species from the residents; but I now think that I did so without sufficient reason. They are probably by no means uncommon in the Forest; but are so shy that they are rarely observed.

Lesser-spotted Woodpecker—P. minor. R.

A hen bird was caught near Savernake House on the 8th of April, 1870, by one of the underkeepers. Another was taken in January, 1873, by Mr. Chandler. Several other instances might be added, both of their capture and of their breeding with us. I now class this and the last species among the rarer residents.

Creeper—Certhia familiaris. R.
Wren—Troglodytes vulgaris. R.
Nuthatch—Sitta europea. R.
Wryneck—Yunx torquilla. S.
Cuckoo—Cuculus canorus. S.
Kingfisher—Alcedo ispida. R.
Swallow—Hirundo rustica. S.
Martin—H. urbica. S.
Sand Martin—H. riparia. S.

Till within the last few years sand-martins bred in the green sandstone of the cutting in which Savernake Station stands. I believe they have now quite deserted this, nor do I know any other station within our district There is, or was till lately, a colony of these birds in a sand-pit at the side of the road from Marlborough to Swindon, close to the latter place.

Swift—Cypselus apus. S.
Goatsucker—Caprimulgus europæus. S.

This is another of the birds that I remove from the list of occasional, to that of regular visitors.

Ring Dove—Columba palumbus. R.
Stock Dove—C. œnas R.
Turtle Dove—C. turtur. S.
Pheasant—Phasianus colchicus. R.
Partridge—Perdix cinerea. R.
Red-legged Partridge—P. rufa. R.O.

On a previous occasion I had to record the occurrence of one of these birds, and I now have to add, at least, three more instances. Mr. Tanner of Ogbourne Maizey has a specimen which he shot last year (1875). He also tells me that he has seen another this year, and that he believes them to be on the increase in the district—a bad look-out for the common partridge, for the two species never seem to thrive together. In the first week of June, 1871, a nest of this bird, containing twelve eggs, was found at Rabley Copse by a gamekeeper named Rushen, to whom we owe several other interesting notes on bird-life.

The Red-legged Partridge is easily distinguished from the common species even when only seen at a distance, by the greater rapidity with which it runs.

Quail—Coturnix vulgaris. S.A.

A Quail's nest containing twelve eggs was found on the 20th of June, 1871.

Bustard—Otis tarda. R.O.

Stone Curlew—Œdicnemus crepitans. R.O.

Golden Plover—Charadrius pluvialis. R.O.

Dotterel—C. morinellus. R.O.

As I know that the Dotterel has occurred, I insert the following rather vague note from our Society's report for Midsummer, 1873. "(Feb.) 8th, small flocks of a species of Dotterel were seen on Lye Bush Hills, known as Avebury and Monkton Downs, by Mr. Brown, keeper. In the winter of 1843 and 1844, large flocks of the Dottrels and Golden Plovers were common on the Aldbourne Downs—*Mr. Coleman.*"

Peewit—Vanellus cristatus. R.

Heron—Ardea cinerea. R.

I was wrong in saying that our nearest Heronry is at Bowood: a few of these birds breed in the Forest. Writing from Bloxham Lodge in the Forest, on the 20th of May, 1870, Mr. Gauntlet says, "herons breed within a mile of my house, about three or four nests every year. I never allow them to be disturbed, but it is strange that they do not increase. The young ones are now just flown. Unfortunately two young ones were blown from out of the nest and died, although the old ones fed them on the ground for several days. But finding they could not get them to take wing.....,they neglected to feed them."

Bittern—Botaurus stellaris. R.O.

Curlew—Numenius arquatus. R.O.

This bird is treated as a doubtful Marlborough species in my book. One has, however, been shot recently. The following notices of this occurrence is quoted from the *Marlborough Times* for July 22nd,—29th of this year.

July 22nd.—"A curlew was rescued from the grasp of a hawk by Wm. Brown, gamekeeper, in the West Woods district, recently. The hawk had devoured so much of the bird that only part of it was available for preservation. There is no recorded instance of the capture of the bird in this neighbourhood."

July 29.—"Our notice of the curlew, last week, has brought out an interesting fact in ornithology. In the "Birds of Marlborough," a very interesting work published some time since by a member of Marlborough College, there appears this extract from Mr. Preston's "Flora" list—"The eggs of this bird have been taken on Aldbourne Downs," the author remarking that he knows nothing about the bird as a Marlborough species. We are now able to verify this fact,

as not only were the eggs taken several years, but a curlew was caught by two Marlborough men, and sold to the late T. B. Merriman, Esq."

* *Whimbrel*—Numenius phœopus. R.O.

This is, as far as I know, quite a new addition to our list. The following notice is from the *Marlborough Times* of the same date as the latter of the two extracts given above:—"Another bird previously unknown in this neighbourhood has been shot by Mr. F. Tanner, of Berwick Bassett, viz., the common Whimbrel (*Numenius phœopus*). This has only occurred once before in Wiltshire, and never near Marlborough; the bird has been stuffed by W. Coleman, of Marlborough." The specimen is at present in the hands of the Rev. T. A. Preston.

Green Sandpiper—Totanus ochropus. R.O.

Common Sandpiper—T. hypoleucos. S.

A very few of these birds probably visit us each year.

Woodcock—Scolopax rusticola. W.

Common Snipe—S. gallinago. W.

Jack Snipe—S. gallinula. W.

Grey Phalarope—Phalarpus lobatus. R.O.

Another pair of these birds has been slaughtered in our district. Here is the record of the tragedy: "One (female) knocked down with a stick, Oct. 18th, 1870: the male was killed next day by Mr. Banning, Junr." This was on the edge of a pond near Pewsey.

Water Rail—Rallus aquaticus. W.

Corncrake—Crex pratensis. S.

* *Spotted Crake*—C. porzana. R.O.

"A specimen of this bird was picked up by W. Coleman, near the Roebuck Inn, Sept. 12th, 1872. It had probably killed itself against the telegraph wires." It is strange how frequently the Crakes are killed in this way. I have known this fate overtake both our species, as well as C. Bailloni.

I must take this opportunity of recording the great services of William Coleman, birdstuffer of this town, in obtaining notices and specimens for us.

Moorhen—Gallinula chloropus. R.

Coot—Fulica atra. R.

Wild Duck—Anas boschas. W.

This is a winter visitor, but a few occasionally breed with us.

* *Pin-tailed Duck*—A. acuta. R.O.

Several new species of ducks have been added to our list, of which this is the first. A specimen was shot by a gamekeeper named Rushen, at Mildenhall, on the 26th February, 1870.

Teal—A. crecca. R.O.

Wigeon—A. Penelope. R.O.

* *Scaup Duck*—Fuligula marila. R.O.

On the 15th of February, 1870, the Rev. C. Soames shot one of these birds at Mildenhall. The specimen was rescued from the hands of the cook and is now in our museum. Mr. S. B. Dixon has recorded another occurence of this bird. This specimen was shot in the Pewsey water meadows, in the beginning of February, 1873, by Mr. C. Goode. He adds that it was a fine specimen and in very good plumage.

**Pochard*—F. ferina. R.O.

A specimen, shot at Elcot Mill about 1869, remained for some years in the possession of a gamekeeper at Overton, but has recently been purchased by the Rev. T. A. Preston.

Golden Eye—F. clangula. R.O.

A second specimen has been shot at Mildenhall.

* *Common Scoter*—Œdemia nigra. R.O.

On the 25th of February, 1873, a specimen of this bird was taken actually in the town of Marlborough. As the gasman was going round to put out the town lights in the morning, he saw a large black bird on the ground, and succeeded in capturing it with his cap. The bird was taken alive to Coleman, the birdstuffer, and was sold by him to Mr. Hillier, who hoped to keep it alive. After a time the bird succeeded in making its escape. About the time of its capture a second similar bird was seen.

Little Grebe—Podiceps minor. R.

Red-necked Grebe—P. rubricollis. R.O.

Red-throated Diver—Colymbus septentrionalis. R.O.

Little Auk—Mergulus melancholicus. R.O.

Puffin—Uria alle. R.O.

* *Shag*—Graculus cristatus. R.O.

One shot at Durnsford Mill, Mildenhall, by Mr. Sydney Willis, Sep. 8th, 1871.

Common Tern—Sterna hirundo. R.O.

Arctic Tern—S. Arctica. R.O.

Black Tern—S. fissipes. R.O.

Another specimen of this species has occurred within our district. Mr. Dixon of Pewsey writes on the 19th of May, 1876, "A

black tern was shot by Mr. James Jarvis at New Mill yesterday. He has sent it to be stuffed by Grant of Devizes."

Common Gull—Larus canus. R.O.

Lesser Black-backed Gull—L. fuscus. R.O.

Herring Gull—L. argentatus R.O.

* *Little Gull*—L. minutus. R.O.

A specimen of this beautiful little Gull was picked up on the Rockley Downs by James Wallis, Feb. 14th, 1870. About that time the species was unusually abundant throughout England.

Stormy Petrel—Thalassidroma pelagica. R.O.

I am unable to record a second occurrence of this bird within our district, though the specimen now in our museum was found not far beyond our radius.

FLORA OF MARLBOROUGH.

PART III, CONTINUED.

38. CAMPANULACEÆ.

This and *Ericaceæ* are known from all other Monopetals by their stamens being almost entirely free from the corolla, and only united to it at their base. *Ericaceæ* are known from *Campanulaceæ* by their woody stems, the stamens always more in number than the lobes of the corolla, and the anthers opening by two small holes, instead of splitting along their whole length.

The plants in this family are either annuals or herbaceous, the stems dying down each year, and consequently very variable in size. There are three Genera, easily distinguished by the shape of the corolla.

Flowers in heads; corolla 2-lipped, the segments long and slender 1. Phyteuma.
Flowers not in heads; corolla bell-shaped; ovary short ... 2. Campanula.
corolla flat; ovary long ... ... 3. Specularia.

Jasione montana is said by Professor Buckman to grow on Silbury Hill. We have been, as yet, unable to detect it. *Phyteuma orbiculare* is not uncommon there, but is not mentioned by Professor Buckman; possibly a confusion in the names may have occurred.

1. Phyteuma Linn.

1. P. orbiculare Linn. *Round-headed Rampion.*

Bab. 222. Hook. 228. Benth. 286.

Chalky Downs. P. July to October.

Root fleshy. Stems generally from one to six inches high, but occasionally as much as eighteen inches. Radical leaves on long stalks, very variable, heart-shaped or lance shaped; stem-leaves much narrower, sessile. Flowers blue, in globular heads, with a few broad bracts at the base.

I. Woodborough, *Rev. J. Sowerby.*

IV. Avebury; Yatesbury, *Rev. A. C. Smith.*

1873. July 26. 1875. ———

1874. By July 31. 1876. By July 14.

2. Campanula Linn.

The species of this genus, which are easily recognised by the shape of the corolla, may be thus distinguished.

Stem leaves narrow, nearly entire.

Lobes of corolla shorter than the tube ... ... 3. rotundifolia.

Lobes of corolla as long as, or longer than the tube 4. patula.

Stem leaves broad, toothed or serrate.

Flowers sessile, crowded into heads ... ... 1. glomerata.

Flowers stalked, in loose clusters ... ... 2. Trachelium.

1. C. glomerata Linn. *Clustered Bell Flower.*

Bab. 223. Hook. 225. Benth. 287.

Dry chalky pastures. P. June to November.

Stems stout, rigid, hairy, generally about a foot high, but often much less. Radical and lower leaves stalked, upper sessile, lanceolate, often cordate at the base, rough. Corolla dark blue; flowers sessile, in small clusters in the upper part of the stem; the topmost ones forming a compact head.

Commonly distributed.

1865.	June 25.	1869.	May 23.	1873.	June 9.
1866.	June 21.	1870.	June 14.	1874.	June 12.
1867.	June 4 (cult.)	1871.	——	1875.	July 6.
1868.	——	1872.	May 28 (cult.)	1876.	July 1.

2. C. Trachelium Linn. *Nettle-leaved Bell Flower.*

Bab. 223. Hook. 227. Benth. 287.

Hedges and thickets. P. July to October.

A very variable plant, but recognised by its larger size, being from two to three feet high; its doubly serrate leaves, and stalked flowers. Some specimens bear a resemblance to the last species, but the above characters are sufficient to distinguish the two.

Not common.

I.—West Woods; Huish, *Rev. J. Sowerby.*

II.—Bedwyn, *Rev. J. Sowerby*; Jockey Woods, Bedwyn, *S. F. Townsend*; Burbage, *F. E. Thompson, Esq.*

III.—Forest Hill, *A. C. and H. M. Hilton*; Littlecote; Ramsbury, *E. F. im Thurn, Esq.*

1870.	July 10	1875.	July 7.
1873.	July 1.	1876.	by July 29.

3. C. rotundifolia Linn. *Hairbell.*

Bab. 223. Hook. 225. Benth. 289.

Downs and heathy places. P. June or July to November.

Rootstock slender, creeping; stems 6 to 18 inches high, glabrous; radical leaves nearly round or broadly heart-shaped, deeply toothed, on long stalks; lower stem leaves lanceolate, stalked, becoming gradually linear and sessile as they ascend the stem. Flowers solitary, or in a loose panicle.

Abundant.

1865. June 18. 1873. July 11. 1875. July 11, June 24 (Binok-Knoll).
1870. June 18. 1874. July 4, 11. 1876. June 29, July 7.

4. C. patula Linn. *Spreading Bell Flower.*

Bab. 224. Hook 226. Benth. 288.

Hedges. B. July to September.

Root slender, not fleshy; stem one to two feet high angular, erect, much branched; radical leaves broad and stalked, stem leaves narrow, lanceolate and sessile; corolla rather deeply divided, calyx segments linear, broader at the base, and finely serrulate.

A plant, occurring in a field between the Pewsey Road and the Wan's Dyke, has been referred to this species by Mr. Baker; and it certainly approaches *patula* more than any other; the root is, however, decidedly fleshy. We have never yet been able to find the plant in an unmutilated state, as the field is mown during our absence; but as far as we can judge from the after-growth, its other characters certainly agree with *patula*.

3. Specularia Heist.

1. S. hybrida A. DC. *Venus' Looking-glass, Corn Bell Flower.*

Bab. 224. Hook 227. Benth. 289.

Corn-fields. A. May to July.

An annual, 6 to 12 inches high; stem simple or branched from the lower part: leaves ovate or oval with waved edges, lower shortly stalked, upper sessile; ovary long, segments of the calyx longer than the petals, which are lilac outside, blue inside and very inconspicuous.

This is often included under *Campanula*, but its flat (rotate) corolla and long capsule give it an appearance very unlike a Bell Flower.

Occurs most frequently in 1, but a few specimens are occasionally found in other districts.

I.—Martinsell, *F. E. Thompson, Esq.*; White Horse Down, *J. J. Pulleine*; near Oare, *Rev. J. Sowerby*; Overton; near Marlborough.

II.—Bedwyn, *Rev. J. Sowerby.*

III.—Ramsbury.

1869. by May 22.	1872. by June 15.	1875. full, May 26.
1870. May 27.	1873. June 28.	1876. full, July 5.
1871. May 28.	1874. May 26.	

39. ERICACEÆ.

See note under Campanulaceæ. Only two species of this family occur near Marlborough, one *Calluna vulgaris*, a low shrub with woody stems, the other as unlike it as can well be conceived, having much the appearance of a parasitic *Orobanche* with its yellow succulent stems and scale like bracts.

1. Calluna Salisb.

1. C. vulgaris Salisb. *Heather or Ling.*

Bab. 227. Hook. 234. Benth. 296.

Dry heaths. Sh. August to October.

Stems from 1 to 2 feet high, much branched. Leaves very small, opposite, forming four rows on the younger branches. Flowers numerous, shortly stalked, with two pairs of bracts under each (having the appearance of an outer calyx) and arranged in racemes on the ends of the branches. Corolla pink (rarely white), deeply divided; calyx longer than the corolla and similarly coloured.

Widely scattered, though nowhere very abundant. White varieties have been found at Clatford by *J. H. Garland*; also on Overton Downs by F. E. Hulme, Esq., F.L.S., F.S.A.

I.—Clatford; Overton; Tan Hill; Cleuch; Bedwyn.

II.—Near Savernake House.

III.—Near Rabley Copse; Row Down.

IV.—Marlborough Common (very sparingly); Chisledon; Avebury. Has always come into flower during the holidays.

2. Monotropa Linn.

1. M. Hypopitys Linn. *Yellow Bird's-nest.*

Bab. 231. Hook. 237. Benth. 299.

Beech and Fir Woods. P. July.

Root of numerous extremely fine fibres, taken by some to be a fungus and not the root. Supposed to be parasitic on the Beech and Fir, though no connection has yet been traced between the plant and tree. Stem succulent, yellow, 6 to 8 inches high. Leaves none or reduced to scales. Flowers in racemes, bent down at first, but afterwards erect. Sepals and petals similar, those of the upper flower in fives, of the other in fours.

Very scarce.

II.—Savernake Forest, *J. J. Pulleine* (under Beeches).

III.—Black Burney Bottom, *Rev. J. Sowerby* (under Firs).

Ramsbury, *Miss A. B. Preston* (also under Firs).

1875. Bud July 10. 1876. July 5.

40. AQUIFOLIACEÆ.

The only British species of this Family is the well-known ever-green tree, with its glossy, ovate, spinous leaves. Flowers shortly stalked, crowded in the axils of the leaves; corolla generally 4 lobed, white, tipped with dull red on the outside: stamens 4.

The British species is gamopetalous, but some foreign ones have the petals separate, and for this reason the family is generally placed among Calycifloræ, being closely allied to Celastraceæ.

1. Ilex Linn.

1. I. Aquifolium Linn. *Holly.*

Bab. 232. Hook. 80. Benth. 103.

Woods and hedges. Tree. May, June.

Very generally distributed, but probably always planted.

1865. May 11.	1869. May 12.	1873. May 17.
1866. About May 14.	1870. May 18.	1874. May 6.
1867. May 11.	1871. May 12.	1875. May 14.
1868. May 13.	1872. May 24.	1876. full bud, May 16.

41. OLEACEÆ.

Trees or shrubs, readily known by their gamopetalous corolla and 2 stamens. Of the two Genera occurring near Marlborough, the ash (*Fraxinus excelsior*) is anomalous, having neither calyx nor corolla, and the flowers being

often imperfect: but the Lilac and Jessamine (which also belong to this Family) form very good links for understanding the true structure of that plant.

Shrub, corolla 4-lobed, leaves simple, fruit a berry ... 1. Ligustrum.
Tree, corolla 0, leaves pinnate, fruit dry, long ... ... 2. Fraxinus.

1. Ligustrum Linn.

1. L. vulgare Linn. *Privet.*

Bab. 232. Hook. 238. Benth. 311.

Thickets and hedges. Sh. June, July.

A shrub, from 4 to 8 feet high; leaves lanceolate, opposite, nearly evergreen. Flowers in panicles at the ends of the branches; corolla white, funnel-shaped; stamens 2; berries black.

Commonly distributed, but almost always planted.

1865. June 12.	1869. bud, June 10.	1873. June 27.
1866. ———	1870. June 12.	1874. June 12.
1867. bud, June 16.	1871. June 25.	1875. June 5.
1868. June 14.	1872. June 21.	1876. June 29.

2. Fraxinus Linn.

1. F. excelsior Linn. *Ash.*

Bab. 232. Hook. 238. Benth. 310.

Woods and hedges. Tree, March to May.

A tall tree with opposite, pinnate leaves (a rare variety with simple leaves occurs). Buds black. Flowers opening before the leaves and "appearing at first sight like clusters of stamens issuing from opposite buds along the last year's shoots, each cluster surrounded by a few small woolly scales." These subsequently expand and a pair of stamens with a pistil between them constitutes the whole flower. Stamens or pistil are frequently wanting. Fruit a *samara*, *i.e.*, a hard ovary with a wing at one extremity.

Perhaps the time of "first flowering" should be taken as that when the stamens are visible.

1865. by April 25.	1969. March 5, 23.	1873. by April 19.
1866. by April 25. (Stamens, April 17)	1870. April 10, 18.	1874. April 21.
1867. April 28. (Stamens, April 19)	1871. March 26.	1875. April 14.
1868. April 5. (Stamens April 1).	1872. March 31.	1876. Ap. 14, (one tree) May 1.

42. APOCYNACEÆ.

In the only British Genus belonging to this Family the stems are slender and ultimately prostrate; the flowers solitary, in the axils of the opposite leaves; calyx with 5 deep narrow divisions; the corolla with a rather long tube surmounted by a large flat limb with 5 broad lobes; stamens 5; carpels 2, free at the base, but connected at the top by a single style, terminated by a curiously shaped stigma. The two species may be thus distinguished.

Leaves and sepals ciliated, flowers large... ... ... 2. major.
Leaves and sepals not ciliated, flowers rather small ... 1. minor.

1. Vinca Linn.

1. V. minor Linn. *Lesser Periwinkle.*

Bab. 233. Hook 239. Benth. 312.

Thickets and Hedge-banks. P. Jan. or Feb. to May or June.

Flowering stems erect, about six inches high: barren stems prostrate, rooting at the nodes: leaves opposite, lanceolate; sepals shorter than the tube of the corolla, which is blue or white.

Very uncommon; probably planted wherever it occurs.

I.—Hedge near Martinsell; copse between Cadley and Wootton Rivers, *J. J. Pulleine.*

1865 Ap. 5.	1869 Feb. 3. (cult.)	1873 Jan. 28. (cult.)
1866 in fl. Mch. 3.	1870 Mch. 10.	1874 Jan. 27. (cult.)
1867 full Feb. 6 (cult.)	1871 full Mch. 18.	1875 (full May 12).
1868 Feb. 25. (cult.)	1872 Feb. 14. (cult)	1876 full Mch. 16.

Cultivated specimens are in flower some little time before the wild ones.

2. V. major Linn. *Greater Periwinkle.*

Bab. 233. Hook. 239. Benth. 312.

Hedges and Thickets. P. April to June.

Flowering stems erect, barren stems at first erect, afterwards prostrate and rooting: leaves opposite, broadly ovate, with ciliated margins. Sepals also ciliated, as long as the tube of the corolla, which is always blue.

Very scarce. Probably always planted

I.—Hedge on the left of the Pewsey road, at the top of Granham Hill, *H. Hall.*

III.—Ramsbury, *Miss Meyrick.*

1865 Ap. 23.	1869 Mch. 17, Ap. 18.	1873 full Mch. 10. (cult.)
1866 Ap. 15.	1870 Ap. 8. (cult.), Ap. 25.	1874 Jan. 28 (cult.) Ap 30
1867 ———	1871 Ap. 2.	1875 Ap. 1.
1868 Ap. 25.	1872 Feb. 19. (cult.)	1876 May 2.

43. GENTIANACEÆ.

The parts of the flower are in fives, rarely fours, and the ovary has either one cell, or is partially divided into two, by which this family may be distinguished from Apocynaceæ.

There are two very well-marked divisions in this family:

(i.)—Herbs, from a few inches to about a foot high, with simple, opposite leaves; terrestrial and annual.

(ii).—Herbs, about a foot high, with alternate leaves, each with three leaflets: aquatic and perennial.

In Div. i., we have three genera.

Stem-leaves connate,* flowers yellow	1. Chlora.
Stem-leaves sessile, flowers pink	2. Erythræa.
flowers purple	3. Gentiana.
In Div. ii., we have only	4. Menyanthes.

1. Chlora Linn.

1. C. perfoliata Linn. *Yellow-Wort.*

Bab. 234. Hook. 240. Benth. 316.

Damp chalky places. A. July to Sept.

Stems about a foot high, unbranched. Root leaves in a rosette, elliptical, narrowed into a foot stalk; stem-leaves opposite, triangular, each pair united by their bases, glaucous. Flowers arranged in cymes.† Calyx deeply divided into eight segments; corolla yellow, also divided into eight segments; stames eight, pistil one.

Though this is a peculiarly chalky district, this species has only been found once, (and then only a single specimen) at Bedwyn, by *W. M. H. Milner.*

2. Erythræa Renealm.

1. E. Centaurium Pers. *Centaury.*

Bab. 235. Hook. 241. Benth. 314.

Dry pastures, road-sides, &c. A. July to October.

Stems about a foot high, quadrangular, branched above. Radical leaves in a rosette, oval, narrowed into a footstalk; stem-leaves narrow, opposite, sessile. Flowers in cymes; calyx of five sepals, corolla funnel-shaped, of five petals, pink; stamens five.

Generally distributed, but not very common.

1865. June 16.	1873. July 1.	1875. July 10.
1870. June 20.	1874. July 4.	1876. July 5.

3. Gentiana Linn.

The two species found about Marlborough are annuals, varying greatly in height from three inches to nearly a foot. Stems square, branched; stem-leaves pointed, opposite; flowers tubular, purple, throat hairy. The two are readily distinguished by the sepals.

Sepals five, petals five, rarely four	1. Amarella.
Sepals four, two outer larger, petals four ...	2. campestris.

1. G. Amarella Linn. *Felwort.*

Bab. 236. Hook. 242. Benth. 316.

Dry pastures. A. June to October.

Generally distributed.

1867. June 9. 1872. May 26. 1876. May 30, June 11.

1869. June 8, (one spec.) 1873. by June 18.

It appears to be very uncertain as to its time of flowering. In 1876, though specimens were found in flower in May and June, yet it certainly was not in bloom at the beginning of August, and it is very probable that no specimens could be found in flower then.

2. G. campestris Linn. *Field Gentian.*

Bab. 236. Hook. 241. Benth. 316.

Dry pastures. A. Aug., Sept.

Scarce and very variable in its appearance, in some years escaping notice altogether. It has never been noticed in flower before the holidays.

I.—Clench; Pewsey Downs, *Rev. T. F. Ravenshaw.*

II.—Near High Trees, *Rev. G. W. DeLisle.*

III.—Marlborough Common, *H. R. Armstrong.*

4. Menyanthes Linn.

1. M. trifoliata Linn. *Buck—or Bog—Bean.*

Bab. 237. Hook 243. Benth. 317.

Boggy places. P. April to June, and again in September.

A plant totally differing in appearance from the other species of the Order; stems round, leafy, creeping; leaves with three leaflets, fleshy, on long stalks; flowers in racemes opposite the leaves; calyx of five sepals; corolla bell-shaped, of five petals, white tinged with pink outside and clothed inside with numerous hairs; a lovely plant, the whole raceme not unlike a hyacinth at first sight.

Scarce.

IV.—Mildenhall, *E. R. Berkeley*. Ramsbury, *J. W. Parrington and L. H. Young*. Stitchcomb, *Rev. J. Sowerby*; Axford; Chilton Foliatt.

1865. full, May 26.	1869. Ap. 19 (cult).	1873. May 10.
1866. by June 6.	1870. Ap. 26.	1874. full, May 27 (cult).
1867. by May 7.	1871. Ap. 27 (cult).	1875. full May 14.
1868. May 6.	1872. May 2, 28.	1876. o. bud, May 28.

44. POLEMONIACEÆ.

1. Polemonium Linn.

1. P. cœruleum Linn. *Jacobs' Ladder.*

Bab. 237. Hook. 244. Benth. 318.

Marshy places. P. May, June.

Stems numerous, about 2 feet high, angular, hollow, unbranched. Leaves mostly alternate, pinnate, with numerous leaflets; Flowers numerous; sepals 5; corolla flat, with 5 lobes, bright blue or white; filaments purple; anthers yellow.

Very scarce.

I.—Water-meadows between Pewsey and Manningford, *Rev. T. F. Ravenshaw*, who says "this is a very old station for it. I find it given in H. C. Watson's New Botanists Guide, 1837;" Woodborough, *Rev. J. Sowerby* and *F. E. Thompson, Esq.*

II.—Savernake, *Rev. J. Sowerby*.

1867. June 6.	1871. bud, May 26.	1874. May 10 (cult).
1868. May 30.	1872. May 9.	
1870. June 13.	1873. May 22.	

45. CONVOLVULACEÆ.

The species of this family (as far as Marlborough is concerned) are climbers, but, with this exception, the two genera of which it is composed are very dissimilar in appearance.

1.—In *Convolvulus* the species are perennials, with alternate leaves and showy funnel-shaped flowers.

2.—In *Cuscuta* the species are annuals, parasitic and leafless, with the flowers small, almost globular in form, and arranged in clusters.

1. Convolvulus Linn.

Two of the three British species are found about Marlborough; they are readily distinquished by their bracts.

Bracts small, distant from the flower ... ... 1. arvensis.
Bracts large, close to the flower ... ... 2. Sepium.

1. C. arvensis Linn. *Field Bindweed.*

Bab. 238. Hook. 245. Benth. 319.

Fields and hedges. P. June to October.

Stems many, angular, prostrate, rarely twining; leaves broadly sagittate; flowers generally solitary, though sometimes in pairs; sepals five, broad; corolla with five prominent folds, pink and white, or wholly white.

Very common.

1865. May 28.	1869. June 12.	1873. June 21.
1866. June 14.	1870. June 3.	1874. June 12.
1867. ———	1871. June 7.	1875. June 5.
1868. May 31.	1872. June 15.	1876. June 29.

2. C. sepium Linn. *Great Bindweed.*

Bab. 238. Hook. 245. Benth. 319.

Hedges and thickets. P. July to October.

Root extensively creeping: stems round, very long, rarely branched; flowers solitary, in the axils of the leaves; sepals five, entirely covered by two large bracts; corolla pure white, rarely pink.

Very common.

1865. June 24.	1873. July 25.	1875. July 10.
1870. June 21.	1874. July 10.	1876. about July 11.

2. Cuscuta Linn.

Parasitic plants, the lower part of the stem soon dying, whilst the upper part creeps extensively, attaching itself by suckers to surrounding plants. In some instances these plants die, and consequently those parts of the Dodder which were nourished by them also die; but long ere this has taken place the Dodder has attached itself to other surrounding plants and thus retains vitality at its extremities. In the case of the Clover Dodder, large patches of clover are killed, and much damage is done to the crop.

Stems thread-like; leaves none; calyx and corolla of the same colour, four or five cleft, the corolla with a circle of scales at the base within, and alternating with its lobes.

At present only two species have been detected about Marlborough (which have been united into one by Bentham), and of which Syme says that "C. Trifolii comes very near to C. Epithymum, of which it is not improbably a sub-species." I venture, therefore, to quote Dr. Syme's distinctions between the two, as the specimens, which I consider to belong to C. Epithymum, have never been decidedly pronounced to be that species by those to whom I have submitted them.

Dr. Syme says, comparing *C. Trifolii* with C. Epithymum, "the heads of flowers are more approximate, larger, the individual flowers considerably larger and the calyx not red, but white, or merely with the segments bordered with red; the stem forms closer coils, and the plant grows in large patches, killing all the clover within the area. According to Prof. Babington, it differs from *C. Epithymum* in having the scales narrow, only half the length of the tube of the corolla, distant, with the sinus between them rounded, and the connecting membrane forming cup-like spaces between itself and the tube of the corolla; while in *C. Epithymum* the scales are as long as the tube of the corolla, and approximate below, with the sinus between them narrow and acute."

Professor Babington also points out that *C. Epithymum* grows upon small shrubby plants, whilst *C. Trifolii* is principally on clover.

1. C. epithymum Murr. *Lesser Dodder.*

Bab. 239. Hook. 246. Benth. 230.

On shrubby plants. A. Aug. to October.

Scarce. Has been found on a hedge at the West end of White Horse Down by *Rev. J. Sowerby*, and at Mildenhall by *Rev. G. W. DeLisle.*

2. C. Trifolii Bab. *Clover-Dodder.*

Bab. 239. Hook. 246. Benth. 320.

On clover. A. August to October.

Not unfrequent, but far more common in some years than in others, naturally depending upon the amount of clover sown.

46. BORAGINACEÆ.

Plants usually covered with coarse, rough, hairs; leaves alternate, generally entire. Flowers in scorpioidal cymes, *i.e*, cymes in which the outer branch is not developed, so that the stem ends in a single flower, below which, on one side, springs a branch, terminating in a flower, and below that another branch, similarly terminated in a flower, and so on. The young flower spike

is therefore curled or rolled inwards upon itself and as the flowers expand this spike uncurls. The flowers are regular, or slightly irregular, the corolla five-lobed, generally with a scale inside between each lobe; ovary deeply four-lobed, which ripens into four nuts, though frequently some are wanting from arrested development.

Corolla irregular ... ... 5. Echium.
Corolla regular.
Tube of corolla more or less closed by scales.
Corolla tubular ... ... 4. Symphytum.
Corolla rotate, anthers forming a cone in the centre ... ... 2. Borago.
Tube of corolla long, slightly bent ... 3. Lycopsis.
Tube of corolla long, straight.
Nuts with hooked bristles ... ... 1. Cynoglossum.
Nuts smooth ... ... 8. Myosotis.
Tube of corolla open.
Calyx deeply divided ... ... 7. Lithospermum.
Calyx not deeply divided ... ... 6. Pulmonaria.

1. Cynoglossum Linn.

1. C. officinale Linn. *Hound's-tongue.*

Bab. 241. Hook. 254. Benth. 329.

Waste places. B. May to September.

Root thick, fleshy; stems two feet high; lower leaves on long stalks, upper sessile, long and narrow; the whole plant covered with soft hairs, forming an exception to the general rule among Boraginaceæ; flowers dull purple; nuts flat, covered with hooked bristles; whole plant fetid, smelling like mice.

Not common; it only occurs in II., in various places in the Forest, and on the hill between it and the town.

1865. May 13.	1869. May 17.	1873. June 7.
1866. June 6.	1870. May 24.	1874. May 26.
1867. May 29.	1871. May 26.	1875. May 19.
1868. May 19.	1872. May 20.	1876. June 3.

2. Borago Linn.

1. B. officinalis Linn. *Borage.*

Bab. 242. Hook. 248. Benth. 328.

Waste ground. B. April to October.

Root fleshy; stem about two feet high, stout and succulent; root leaves on long stalks, lower stem leaves stalked, upper sessile, broadly ovate, with waved edges; whole plant covered with stiff hairs, swollen at the base; corolla bright blue, tube very short, the mouth closed by the long black anthers, which form a cone in the centre of the flower.

Evidently an escape, and therefore hardly entitled to rank as a Marlborough species. It is not considered an indigenous to Britain, though established in some places.

1865. by May 17.	1870. bud Ap. 27.	1872. (March 4.)
1868. May 20.	1871. by June 24.	1873. by Ap. 27.
1869. about Ap. 20.		

The above observations are mainly taken from cultivated specimens.

3. Lycopsis Linn.

1. L. arvensis Linn. *Bugloss.*

Bab. 242. Hook. 249. (*Anchusa.*) Benth. 327

Cultivated fields. A. May to November.

Stem from one to two feet high, procumbent at the base; leaves narrow-lanceolate, waved and toothed at the edges, radical leaves stalked, cauline sessile, uppermost partially embracing the stem; whole plant covered with stiff hairs; flowers small, pale blue, with a long, bent tube and spreading limb, almost sessille.

Occurs only on the Greensand about Pewsey, New Mill, Wilcot, and occasionally at Savernake.

1869. May 1.	1872. by May 9.	1875. June 11.
1870. June 6.	1873. June 13.	1876. in fl. July 5.
1871. by May 9.	1874. (July 4.)	

4. Symphytum Linn.

1. S. officinale Linn. *Comfrey.*

Bab. 242. Hook 249. Benth. 327.

Damp places. P. April to October.

A coarse, rough, perennial, with succulent stems, often three feet high, with large ovate-lanceolate radical leaves on long stalks, and lanceolate sessile

stem leaves, strongly decurrent (*i.e.*, with the blade continued down the stem of the plant, so as to make it "winged") corolla pale yellow or purple, tubular, the upper half of greater width than the lower. The variety *patens* has the corolla "bright dark purple; the leaves rather narrower, less decurrent, and darker green; stems tougher and less succulent, and the branches less spreading than in the ordinary form.

Common.

1865. Ap. 30.	1869. Ap. 16.	1873. Ap. 20.
1866. Ap. 28.	1870. Ap. 21.	1874. Ap. 24.
1867. Ap. 29.	1871. Ap. 23.	1875. full May 3.
1868. Ap. 22.	1872. Ap. 24.	1876. Ap. 26.

S. asperrimum, a less robust plant, with only slightly decurrent leaves, and the flowers red before expanding, afterwards changing to blue, has been naturalised in a hedge near Granham Farm.

1865. by June 12.	1869 ———	1873 June 12.
1866. ———	1870. June 5.	1874. full May 24.
1867. May 30.	1871. ———	1875. May 12.
1868. May 17.	1872. by June 16.	1876. June 27.

5. Echium Linn.

1. **E. vulgare** Linn. *Viper's Bugloss.*

Bab. 243. Hook. 248. Benth. 322.

Dry places. B. June to Oct. or Nov.

Stems from one to two feet high; radical leaves more or less lanceolate, stalked; stem leaves strap-shaped, sessile: the whole plant thickly covered with white hairs, among which are scattered longer and stiff hairs seated on tubercles; corolla tubular; rather irregular, at first red, afterwards blue, with the stamens projecting beyond the mouth of the tube; flowers in cymes, arranged along a central stem.

Very uncommon.

I.—Railway bank, *E. F. im Thurn*; Wansdyke, *F. E. Thompson, Esq.*

II.—Bedwyn Brails, *F. E. Thompson, Esq.*

IV.—Row Down, *W. Howard.*

1865. by June 18.	1869.———	1873. June 18.
1866.———	1870. full June 20.	1874. June 21.
1867.———	1871. by June 16.	1875. June 7.
1868. June 15.	1872. June 22. (cult.)	1876. June 22.

6. Pulmonaria Linn.

1. P. officinalis Linn. *Lungwort.*

Bab. 243. Hook. 251. Benth. 323.

Woods and thickets. P. Feb. to June.

Radical leaves in tufts broadly ovate, on long stalks, spotted with pale green and rough to the touch; flowering stems about six inches high, with a few leaves, the lower very shortly stalked, the upper sessile, broadly lanceolate, and spotted; corolla rose-coloured, changing to pale purple; cymes few flowered.

In a lane near Bloxham's Lodge, Savernake Forest. It is considered to be truly wild there.

The times of flowering are those of cultivated plants.

1865. full Ap. 15.	1869. Feb. 18.	1873. March 27.
1866. Ap. 8.	1870. Ap. 1.	1874. Feb. 23.
1867. full Ap. 23.	1871. March 11.	1875. ——
1868. March 6.	1872. March 7.	1876. March 11.

7. Lithospermum Linn.

Stiff, hispid plants, from one to two feet high or more; when in seed readily known by the hard, grey or brownish nuts, which almost seem as if made of china. The two Marlborough species may be thus distinguished.

Perennial; root whitish; flowers greenish yellow; nuts
smooth ... ... 1. officinale.
Annual; root red; flowers white; nuts wrinkled ... 2. arvense.

1. L. officinale Linn. *Gromwell.*

Bab. 244. Hook. 250. Benth. 324.

Hedges and Copses. P. May to July.

Stems many, 1 to 3 feet high, branched, rough with the tuberous bases of the stiff hairs: leaves lanceolate, pointed, rough with bulbous bristles above, hairy beneath. Flowers greenish yellow; nuts grey, highly polished and smooth.

Not common.

I.—Copse near Pentawick; Martinsell, *Rev. J. Sowerby*; Huish, *G. H. Dartnell, Esq.*

II.—Savernake.

IV.—Rabley; Black Burney Bottom; Rockley.

1869. May 18.	1872. May 20.	1875. May 27.
1870. May 23.	1873. May 31.	1876. June.
1871. May 17.	1874. May 9.	

2. L. arvense Linn. *Corn Gromwell.*

Bab. 244. Hook. 250 Benth. 323.

Arable fields. A. April to October.

Stems only about 1 foot high, generally solitary, branched, rough with bristles, but not so rough as in the former species; leaves narrow-lanceolate, blunt, hoary with adpressed hairs; flowers white; nuts pale brown, pitted and polished.

Not uncommon.

1865. April 29.	1869. April 22.	1873. May 4.
1866. April 23.	1870. May 20.	1874. May 3.
1867. May 9.	1871. April 6.	1875. May 17.
1868. April 29.	1872. April 12.	1876. May 27.

8. Myosotis Linn.

A genus easily known by its bright blue flowers, all the species often being included under the common name of *Forget-me-not.* They all have narrow stem leaves and broader radical ones, covered with rough hairs, except in the case of *M. palustris*, which is generally glabrous, though sometimes (especially when growing out of water) covered with spreading hairs.

The four Marlborough species may be thus distinguished.

Hairs on the calyx straight and adpressed; perennial 1. palustris

Hairs on the calyx hooked and spreading; annual.

Calyx of the fruit shorter than its stalk ... ... 2. arvensis

Calyx of the fruit not shorter than its stalk

Flowers always blue ... ... 3. collina

Flowers at first yellow, then blue... ... ... 4. versicolor

1. M. palustris With. *Forget-me-not.*

Bab. 244. Hook. 252. Benth. 325.

Ditches and watery places. P. May to November.

When growing in watery places, this species is very easily recognised by its large size, creeping stems, and large flowers of a bright clear blue, with a yellow eye, but starved specimens in dry places approach *M. arvensis* in general appearance. The adpressed hairs of the calyx, which has also its teeth short and triangular, will serve to separate it from its congeners.

Common.

1865. June 3.	1869. May 27.	1873. June 13.
1866.	1870. May 21.	1874. May 30, June 12.
1867.	1871. May 26.	1875. June 17.
1868. May 19.	1872. May 17.(one spec.)	1876. June 25.

2. M. arvensis Lehm. *Field Scorpion-grass.*

Bab. 245. Hook. 253. Benth. 325.

Fields and waste places. A. April to November.

Rather variable in appearance, and when very small bears some resemblance to *M. collina*. Its longer pedicels, more leafy stems, and very short style will serve to distinguish this species. The flowers, also, though often very small, have not the intense blue of *M. collina*.

Abundant.

1865. Ap. 30.	1869. Ap. 26.	1873. Ap. 18 (cult. Ap. 3)
1866. Ap. 16.	1870. Ap. 26.	1874. Ap. 24.
1867. May 6.	1871. Ap. 25	1875. May 5.
1868. Ap. 4, by May 1.	1872. Ap. 6.	1876. May 9.

3. M. collina Hoffm. *Early Scorpion-Grass.*

Bab. 245. Hook. 253. Benth. 326.

Dry Banks. A. April to June.

Stems varying from half an inch upwards, rarely as much as six inches high, with a few leaves on its lower parts. The lowest flower on the main stem is usually distant from the rest, and in the axil of a leaf-like bract; pedicles very short; corolla very small, deep blue, concave; the style about half as long as the calyx, which remains open after flowering.

I.—Field near Barton Farm; Martinsell; Pewsey, *Rev. T. F. Ravenshaw.*

II.—Savernake.

III.—Mildenhall Borders; Chilton.

IV.—Field near Sun Lane, *J. J. Pulleine.*

1865. by Ap. 30.	1869. Ap. 20.	1873. May 1.
1866. by Ap. 23.	1870. Ap. 19.	1874. Ap. 5.
1867. Ap. 14.	1871. by Ap. 25.	1875. full May 10.
1868. May 1.	1872. Ap. 7.	1876. Ap. 28.

4. M. versicolor Reich. *Changeable Scorpion-Grass.*

Bab. 245. Hook. 254. Benth. 326.

Meadows and Banks. A. May, June.

Not unlike *M. collina*, but is altogether a larger plant (varying from three inches to nearly a foot high), and not so much branched; the lowest flowers not separate from the others, and the corolla is at first pale yellow, generally changing to blue; the style is about as long as the calyx, which covers over the fruit after flowering.

Distributed, but not common.

I.—Martinsell, *Rev. J. Sowerby*; Pewsey, *Rev. T. F. Ravenshaw*; Wootton Rivers.

II.—Between Savernake and Grafton, *Rev. J. Sowerby.*

III.—Stitchcomb.

IV.—Chilton.

1865. May 25.	1869. May 1.	1873. May 6.
1866. fl. & seed May 22.	1870. by May 18.	1874. May 10 (cult).
1867. by May 19.	1871. May 6.	1875. May 13.
1868. full May 6.	1872. April 30.	1876. May 20.

47. SOLANACEÆ.

Poorly as this order is represented in England, we have but two species near Marlborough, and of those two one is very scarce, and were it not for its locality in the Forest, where it appears to have grown for some years, it would hardly be entitled to a place among Marlborough plants.

The two genera (each containing one species) are very distinct, their most important difference consisting in the fruit, that of *Solanum* being a berry, and of *Hyoscyamus* a dry capsule, but their other numerous differences will be alluded to under the description of each species.

1. Solanum Linn.

1. S. Dulcamara Linn. *Bitter-Sweet.*

Bab. 247. Hook. 256. Benth. 332.

Damp hedges and thickets. P. June to September.

Perennial; rootstock creeping; stems shrubby at the base, with climbing or zizag branches, from four to six feet long, but dying back during the winter, glabrous or downy; leaves cordate, often with two smaller lobes at the base, glabrous, sometimes downy on both sides; flowers in loose clusters opposite the leaves, corolla deeply five-cleft, purple with two green spots at the base inside each segment; anthers yellow, forming a cone in the centre of the flower; berries red.

Generally distributed, but not very common.

The name "Bitter-sweet" is said to be derived from the taste of the berries, which is at first bitter and then sweet; but it is very unadvisable to try the experiment.

1865. May 23.	1869. June 5.	1873. June 7.
1866. June 11,	1870. May 30.	1874. June 12, 17.
1867. just in fl. June 18.	1871. June 18.	1875. June 10.
1868. May 31.	1872. June 15.	1876. June 11.

2. Hyoscyamus Linn.

1. **H. niger** Linn. *Henbane.*

Bab. 247. Hook. 255. Benth. 331.

Waste places. B. May to September.

Biennial; root fleshy; stem stout, erect, branched, about 2 feet high; covered with long soft glandular hairs; radical leaves stalked, stem leaves sessile, ovate, with a few large lobes or teeth, covered, like the stem, with long viscid hairs, and very fetid; flowers very shortly stalked and arranged in two rows along one side of the stem, which is rolled back at the top before flowering; calyx increasing after flowering, lower part globular, upper part with five stiff, almost prickly, lobes; corolla with five broad lobes, dingy yellow, veined with purple (rarely without the dark veins); anthers purple.

Very scarce.

II.—Roadside, Savernake Forest.

IV.—Poulton Farm Yard; Ramsbury, *Miss Meyrick.*

1865.	by June 4.	1872.	May 30 (cult.)	1875.	———
1866.	June 6.	1873.	by May 31.	1876.	———
1869.	by June 17.	1874.	June 12.		

48. OROBANCHACEÆ.

Parasites, yellow or various shades of brown or purple; stem simple (very rarely branched); leaves reduced to scales, scattered along the stem: flowers in spikes, each flower in the axil of a bract similar to the scales, and sometimes with two smaller bracts on each side of the calyx. Ovary of one cell, by which it is distinguished from the next order, *Scrophulariaceæ*. The two genera are most easily separated by their calyx.

Calyx deeply 4-cleft ... ... 1. Orobanche.

Calyx with 4 broad short teeth ... ... 2. Lathræa.

A further distinction is also pointed out by Dr. Hooker, viz., that after flowering the upper part of the corolla in *Orobanche* falls off, leaving the base still surrounding the ovary, whilst the corolla falls off in one piece in *Lathræa*.

These plants being Parasitic, it is very necessary to find out the plant to which each specimen is attached, and this is occasionally a difficult matter, especially if the ground is at all hard and stony. In Lathræa the portion under the ground becomes thick and fleshy from a number of scales which entirely cover it (whence the name *Squamaria*); this ramifies ex-

ceedingly, and though I have specimens over seven inches in length, I have never yet been able to trace it up to the plant to which it is actually attached, mainly owing to the excessive brittleness of the stem and the matted roots of the foster-plant. In *Orobanche*, however, the lower portion of the stem is swollen, and from this proceed a number of short, slender, rather succulent rootlets, and one, equally slender, but much longer, by which it is attached to its proper plant. This slender root increases slightly in thickness, and at the actual point of attachment is rather more swollen, but however long it may be (and I have traced one for about six feet, through hard chalk), it seems to preserve its slender character, so that it becomes a matter of considerable difficulty at times to dig it up without breaking. The stoutest specimen I have met with was about the thickness of thin whip-cord. The same plant may have several specimens of *Orobanche* attached to it by distinct roots, but it is curious how the *Orobanche* can find out a proper foster plant when it has to go as far as six feet to reach one.

1. Orobanche Linn.

Only two species have as yet been detected about Marlborough, one the common *O. minor*, very generally distributed, and the other the rare *O. elatior*. The two plants differ greatly in size, the former ranging about six inches high, the latter often as much as 8 feet.

1. O. elatior Sutt. *Tall Broom-Rape.*

Bab. 249. Hook. 275. Benth. 335.

Parasitical upon *Centaurea Scabiosa*. P. (?) June, July.

Stem from two to three feet high; whole plant brownish yellow; corolla tubular, curved at the top and slightly compressed in its upper parts; stigmas yellow.

I believe I once found this on *Carduus arvensis*, but the ground was very hard, and the root broke; the nearest specimen of *Centaurea Scabiosa* was not less than from 18 to 20 feet distant.

Very scarce; has occurred only in iv.

IV.—Row Down, *A. Busk*; Ogbourne, *Rev. G. W. De Lisle*; Rabley Copse; Poulton, *W. G. Hughes*.

1865.	full June 23.	1871.	bud June 25.
1866.	bud June 20.	1873.	by July 1.
1870.	June 28.	1876.	July 5.

2. O. minor Sutt. *Small Brown Rape.*

Bab. 250. Hook. 276. Benth. 335.

Chiefly on *Trifolium pratense.* A. June, July.

Stem about six inches high, yellow or various shades of dull purple; flowers generally in lax spikes, sometimes only about six in a spike, but occasionally larger specimens, when dry, are rather like small specimens of *O. elatior.* The distinctions which could be pointed out on paper are very minute, but the *habit* of the two plants is different and a practical acquaintance with the plants in a fresh state, will alone enable a person to name them when dry.

By no means uncommon in clover fields, where it may be found growing not only on the clover, but also on *Carduus arvensis, Plantago major,* and other plants, also on roadsides on various leguminous plants.

A yellow variety was not uncommon one year in a field at Preshute.

1865. By June 19.	1869. June 5.	1873. June 5.
1866. June 15,	1870. June 10.	1874. June 5.
1867. by June 14.	1871. ——	1875. full June 7.
1868. full June 8.	1872. full June 20.	1876. June 20.

2. Lathræa Linn.

1. L. squamaria Linn. *Toothwort.*

Bab. 251. Hook. 277. Benth. 336.

Parasitical on hazels, &c. P. March to May.

Whole plant pale pink; stem about six inches high; scales broad, sparingly scattered on the stem; flowers in a one-sided spike, bent downward at first, but afterwards erect. Corolla dull purple, with the style, and sometimes the stamens, projecting beyond it.

Not common.

I.—Granham Copse, and Copses on White Horse Down; Pewsey, *Rev. T. F. Ravenshaw.*

II.—Tottenham, *J. J. Pulleine.*

IV.—Ramsbury.

1865. April 24.	1869. April 11.	1873. March 30.
1866. March 30.	1870. April 26.	1874. April 3.
1867. April 10.	1871. by April 2.	1875. April 8.
1868. by April 3.	1872. March 10.	1876. April 7.

49. SCROPHULARIACEÆ.

Plants of very varying habit, but always known by their gamopetalous corrolla, irregular flowers, and superior ovary divided into two cells with several seeds in each. In this order may be traced a very interesting connection between the stamens and regularity of the Corolla, especially when foreign plants are taken into consideration. The number of petals is properly five, and consequently we might expect five stamens. When five stamens of equal length occur, we get a regular flower as in the Petunia, in Verbascum, however, where they are not all similar, there is a slight irregularity, and this genus approaches more nearly to the flowers in regularity than those of any other British one of this Order. In one case of monstrosity, viz.: *Linaria vulgaris*, which normally has only four stamens, the flower has only one spur, but when it has five stamens (as is sometimes, though rarely, the case), it has five spurs and the flower is perfectly regular. In the garden *Pentstemons* we meet with five stamens, but one of them imperfectly developed, consequently we have an approach to a regular flower, but not perfectly so. Where we meet with only four stamens as in Scrophularia, Antirrhinum, &c., the flower is very irregular, but still even in these cases, when a fifth stamen is more or less develloped (called a *Staminode*), the regularity of the flower is more or less perceptible.

Stamens 5. ... ... 1. Verbascum
Stamens 4.
  Corolla with a distinct spur ... ... 3. Linaria.
  Corolla without a distinct spur.
    Calyx with five lobes or teeth.
      Leaves pinnatifid ... ... 6. Pedicularis,
      Leaves not pinnatifid.
        Leaves narrow, entire ... 2. Antirrhinum.
        Leaves broad, serrate or dentate 4. Scrophularia.
    Calyx with four lobes or teeth.
      Flowers yellow.
        Calyx inflated, seeds many ... 7. Rhinanthus.
        Calyx tubular, seeds one or two in each cell ... ... 5. Melampyrum.
      Flowers pink, leaves three or four times as long as broad ... 9. Odontites.
      Flowers white or lilac, leaves about as long as broad ... ... 8. Euphrasia.
Stamens 2. ... ... 10. Veronica.

1. Verbascum Linn.

Tall, coarse plants, more or less covered with woolly hairs, one especially being commonly called "Flannel plant" from the abundance of them with which it is clothed. Corolla yellow, tube very short, limb spreading, with five nearly equal lobes. Stamens five.

Till within the last month we had only detected two species about Marlborough, and one apparently a hybrid between those two. A third species has now been added to our list.

Leaves strongly decurrent, flowers in a simple, dense, spike ... ... 1. Thapsus.

Leaves not decurrent, or very slightly so.

Flowers in a raceme, one to each bract ... 3. Blattaria.

Flowers several to each bract ... ... 2. nigrum.

1. V. Thapsus Linn. *High-taper. Great Mullein.*

Bab. 253. Hook. 260. Benth. 338.

Waste ground. B. June to October.

Stem stout, erect, from one to two feet high, rarely branched, clothed with dense woolly hairs. Leaves oblong, pointed, crenate, narrowed at the base, and forming two wings for some distance down the stem, also densely woolly. Stamens five, three with white hairs and 1-celled anthers, the two others longer and glabrous.

Generally distributed, but by no means common.

1865. June 11.	1869. bud June 20.	1873. June 13.
1866. June 25.	1870. June 19.	1874. June 30.
1867. ———	1871. ———	1875. June 29.
1868. June 14.	1872. June 21.	1876. June 29.

2. V. nigrum Linn. *Dark Mullein.*

Bab. 254. Hook. 261. Benth. 339.

Roadsides. P. July, August.

Stems several, from two to three feet high, sparingly branched, and covered with short down, easily rubbed off, but far less dense than in the former species; leaves oval, doubly crenate on the edges, sparingly hairy or even glabrous above, woolly underneath, the lower leaves on long stalks, with a cordate base, upper leaves sessile; flowers rather small, several together in the axils of the bracts, filaments with purple hairs.

Very uncommon.

I.—Clatford Bottom; Overton.

1868. June 19.	1874. ———
1869. July 3.	1875. July 11.
1873. by July 27.	1876. bud July 11.

3. V. Blattaria Linn. *Moth Mullein.*

Bab. 254. Hook. 261. Benth. 338.

Gravelly banks. B. August, September.

Plant glabrous; stem sparingly branched; leaves oblong, crenate, upper sessile, lower tapering into short stalks. Flowers as large as those of *V. Thapsus*, solitary in the axils of the bracts, on rather long stalks, yellow, tinged with red on the outside of the bud; filaments covered with purple hairs.

Mildenhall.

2. Antirrhinum Linn.

1. A. Orontium. *Lesser Snapdragon.*

Bab. 255. Hook. 263. Benth. 340.

Gravelly fields. A. July, August.

Stems about a foot high, erect, slightly branched; leaves opposite, long and narrow; flowers rose coloured, in loose spikes at the ends of the stems; sepals longer than the corolla.

Found by *Miss Mcyrick*, at Ramsbury, July 2, 1836. The specimens are now in the College Museum. Not recorded since.

3. Linaria Mill.

Closely allied to *Antirrhinum*, differing in the spur to the corolla. The individuals differ very considerably in habit.

Stems trailing

Plant glabrous... ... ... 1. Cymbalaria.

Plant hairy

Leaves oval ... ... 3. spuria.

Leaves with a projection on each side at the base ... ... 2. Elatine.

Stems erect.

Perennial, flowers yellow, 1—3 feet high 5. vulgaris.

Annual, flowers lilac, 3—6 inches high 4. minor.

1. L. Cymbalaria Mill. *Ivy-leaved Toad-flax.*

Bab. 255. Hook. 261. Benth. 342.

Old walls, P. April to October.

Stems very slender, trailing, rooting; leaves broad, five-lobed, glabrous; flowers on long stalks in the axils of the leaves, solitary, pale purple.

Not common. On a few old walls at the East end of the town, Ramsbury, Bedwyn, Manningford Bruce, &c.

1865. by May 11.	1869. Ap. 17.	1873. May 31.
1866. Ap. 26.	1870. Ap. 26.	1874. Ap. 22.
1867. May 8.	1871. ———	1875. May 15.
1868. Ap. 8.	1872. Mch. 25.	1876. May 6.

2. L. Elatine. *Fluellin.*

Bab. 255. Hook. 262. Benth. 343.

Corn-fields. A. July to October.

Stems prostrate, branching from the roots; leaves ovate, pointed at the base, slightly hairy; flowers on long, glabrous stalks, in the axils of the leaves; sepals narrow; corolla with a long spur, yellow with a purple lip.

Scarce.

I.—Near Clatford, *Rev. J. Sowerby.*

II.—Bedwyn.

IV.—Aldbourne Downs, *Rev. J. Sowerby.*

3. L. spuria Mill. *Round-leaved Toad-flax.*

Bab. 255. Hook. 262. Benth. 342.

Corn-fields. A. July to November.

Stems prostrate, branching from the base; leaves oval, with here and there a small tooth; the whole plant hairy, some of the hairs tipped with viscous glands; flowers on hairy stalks about half the length of the leaves; sepals broad; corolla with a long spur curved upwards, yellow with a purple lip. The whole plant bears some resemblance to the former species, but is larger in every respect,

Scarce.

I.—Huish, *Rev. J. Sowerby.*

II.—Bedwyn, *F. E. Thompson, Esq.*

IV.—Aldbourne, *Rev. J. Sowerby.*

4. L. minor Desf. *Least Toad-flax.*

Bab. 255. Hook. 263. Benth. 342.

Gravelly places. A. May or June to October.

Stems from 3—6 inches high, branched throughout; leaves linear, lanceolate, plant covered with gland-tipped hairs; flowers stalked, in the axils of the leaves; corolla small, pale purple with a yellow lip, slightly exceeding the calyx.

Distributed, principally in I.

I.—Overton, *Rev. J. Sowerby*; Wan's Dyke, *E. L. Hesketh* and *J. B. Fuller*.

II.—Railway bank.

1865. June 5.	1869. ——	1873. June 8, (cult. June 1).
1866. ——	1870. May 30.	1874. May 29.
1867. ——	1871. about June 6.	1875. May 23.
1868. by June 11.	1872. June 3 (cult.)	1876. June 23.

5. **L. vulgaris** Mill. *Yellow Toad-flax.*

Bab. 256. Hook. 262. Benth. 341.

Hedges. P. June to November.

Rootstock extensively creeping; stems from 1—3 feet high, branched, glabrous; leaves long and narrow, glaucous, scattered in irregular whorls of three, especially on the lower part of the stem; flowers in racemes at the ends of the stem and branches, yellow with bright orange coloured lip.

Generally distributed, but not common.

1865. June 6.	1869. ——	1873. June 23.
1866. June 11.	1870. June 11.	1874. June 23.
1867. ——	1871. ——	1875. June 14.
1868. June 10.	1872. June 21.	1876. June 23, July 5.

4. Scrophularia Linn.

The two Marlborough species are tall glabrous plants, with square stems, opposite leaves, and a large terminal panicles of small dull-purple flowers. Corolla nearly globular, with five short, broad lobes, the two upper united and forming an erect upper lip; stamens four, a fifth one being represented by a scale under the upper lip.

Stems not winged, leaves acute .. .. 1 nodosa.

Stems winged, leaves blunt ... ... 2 aquatica.

1. **S. nodosa** Linn. *Knotted Figwort.*

Bab. 257. Hook. 264. Benth. 340.

Moist hedges and thickets. P. May to October.

Rootstock short with a number of round fleshy tubers; stems from one to three feet high, quadrangular, but not winged, though with a raised line at the angles; leaves triangular-ovate, pointed, doubly and acutely serrate; flowers in a lax pyramidal panicle; sepals with a narrow membranous margin.

Common.

1865. June 2.	1869. June 2.	1873. June 5.
1866. just in fl. May 29.	1870. May 29.	1874. May 26.
1867. June 1.	1971. about May 27.	1875 June 5.
1878. May 27.	1872. May 24.	1876. June 1.

S. aquatica Linn. *Water Betony.*

Bab. 257. Hook. 264. Benth. 344.

Wet Places. P. June to October.

Similar in many respects to the last; but the rootstock is not tuberous; the stems are distinctly winged; the leaves are more distinctly ovate or oblong, blunt at the apex, the edges crenate, and sometimes with a few small lobes proceeding from the wing of the petiole, so as to make it pinnatifid; the panicle of flowers is denser and less pyramidal in form, and the sepals are surrounded with a broad membranous margin.

Common.

1865. June 8.	1869. bud June 16.	1873. June 18.
1866. ———	1870. June 10.	1874. June 12.
1867. ———	1871. about June 20.	1875. June 19.
1868. June 3.	1872. June 21.	1876. June 24.

5. Melampyrum Linn.

1. M. pratense Linn. *Cow-wheat.*

Bab. 258. Hook. 274. Benth. 356.

Woods and thickets. A. May to September.

Parasitic; stems about a foot high, wiry, glabrous, with opposite spreading branches; leaves lanceolate with a cordate base and acute point, entire, very shortly stalked, glabrous. Flowers in pairs, pale yellow; lower bracts exactly like the leaves, upper with a few teeth at the base. Turns black in drying.

Occurs in all the Copses.

1865. May 23.	1869. May 27.	1873. May 31.
1866. May 26.	1870. May 27.	1874. May 18.
1867. Ap. 1.	1871. May 26.	1875. May 27.
1868. May 9.	1872. June 1.	1876. May 30.

6. Pedicularis Linn.

Herbs, turning black in drying, parasitic. Leaves alternate, deeply pinnatifid, the lobes deeply toothed; flowers pink, in loose racemes, with a

bract under each more or less resembling the leaves; corolla 2-lipped, much longer than the tubular calyx, which becomes inflated after flowering. Whole plant glabrous and slightly succulent.

The two Marlborough species are very similar to one another, the differences, except those of size and habit, being very minute.

Stem from 1 to 2 feet high, erect, branched, calyx with 2 short irregularly cut lobes ... ... 1. palustris.

Stems from 3 to 10 inches long, prostrate, springing from the root; calyx with 4 or 5 short lobes or teeth ... ... 2. sylvatica.

Bentham also points out that the upper lobe of the corolla in *P. palustris* has a tooth on each side at or below the middle, which is wanting in *P. sylvatica*, but this is denied by Babington; at best it is very indistinct.

1. P. palustris Linn. *Red Rattle.*

Bab. 259. Hook. 273. Benth. 354.

Marshy places. A. June to September.

Occurs only at Axford and Ramsbury.

1867. by June 20. 1872. May 24. 1875. ———

1868. not in bud June 8. 1873. full July 12. 1876. full July 29.

1869. June 10.

2. P. sylvatica Linn. *Lousewort.*

Bab. 259. Hook. 273. Benth. 354.

Damp heathy pastures. P. April or May to September.

Widely distributed, but not common.

1865. May 5.	1869. April 30.	1873. May 31.
1866. April 30.	1870. May 13.	1874. May 1.
1867. full May 6.	1871. May 17.	1875. May 16.
1868. April 29.	1872. April 18.	1876. May 8, June 27.

7. Rhinanthus Linn.

1. R. Crista-galli Linn. *Yellow Rattle.*

Bab. 259. Hook. 272. Benth. 353.

Meadows and pastures. A. May, June.

Parasitic herbs from 6 to 18 inches high, turning black in drying; stems quadrangular, simple, except in very large specimens; leaves opposite, distinct, long, and narrow, deeply serrate; flowers in spikes, crowded towards the top of the stem; lower bracts similar to the leaves; calyx inflated, with

four broad teeth; corolla twice as long as the calyx, yellow, the upper lip with two bright blue spots.

Common.

1865. May 23.	1869. May 11.	1873. May 22.
1866. May 26.	1870. May 26.	1874. May 14.
1867. May 26.	1871. May 17.	1875. by May 17.
1868. May 15.	1872. May 8.	1876. May 25.

8. Euphrasia Linn.

1. E. officinalis Linn. *Eye-bright*

Bab. 260. Hook. 272. Benth. 353.

Pastures and grassy places. A. May to October.

Root parasitic; stems from 1 or 2 to 10 inches, rarely higher, wiry, branched; leaves ovate or lanceolate, nearly as broad as long, deeply serrate; bracts like the leaves; flowers in spikes, crowded at first; corolla pale lilac, with darker stripes and a yellow spot on the lower lip.

Very common.

1865. ———	1869. May 17.	1873. May 27.
1866. ———	1870. June 17.	1874. July 6, 31.
1867. ———	1871. ———	1875. June 26, July 6.
1868. June 10	1872. May 24.	1876. June 27.

9. Odontites Duby.

1. O. rubra Pers. *Red Bartsia.*

Bab. 261. Hook. 271. (*Bartsia Odontites.*) Benth. 352. (*Bartsia Odontites*).

Corn-fields and waste places. A June to October.

Similar in many respects to the last, differing chiefly in the corolla, which has the upper lip nearly entire and concave, whereas in *Euphorasia* it is 2 lobed and spreading. It is, however, a larger plant (being sometimes as much as 18 inches or 2 feet high), the branches less in proportion to the stem and slightly downy; the leaves very much longer and narrower; and flowers purplish red, in one-sided spikes.

Common.

1865. June 16.	1869. June 13.	1873. June 27.
1866. June 25.	1870. June 25.	1874. June 12.
1867. ———	1871. about June 20.	1875. June 27.
1868. June 13.	1872. June 15.	1876. June 29.

10. Veronica Linn.

All the British species of this order are herbs with opposite leaves, and blue or pink flowers arranged in racemes, rarely solitary; corolla of four lobes; stamens two.

Racemes terminal.

- Plant glabrous; style long; corolla whitish with blue veins ... ... 7. serpyllifolia.
- Plant hairy; style short; corolla blue ... 8. arvensis.

Racemes axillary.

- Plant glabrous.
  - Leaves narrow; stem slender, brittle, flowers pinkish ... ... 1. scutellata.
  - Leaves oblong, stem stout, succulent, flowers pinkish ... ... 2. Anagallis.
  - Leaves oval, stem stout, flowers dark blue 3. Beccabunga.
- Plant hairy.
  - Stem with a line of hairs on each side, leaves sessile or nearly so ... ... 4. Chamædrys.
  - Stem hairy all round, leaves stalked.
    - Flowers sessile or nearly so ... ... 6. officinalis.
    - Flower stalks twice as long as the bracts ... ... 5. montana.

Flowers solitary, axillary.

- Lobes of the capsule compressed... ... ... 11. Buxbaumii.
- Lobes of the capsule rounded
  - Sepals heart-shaped at the base ... ... 12. hederifolia.
  - Sepals ovate or lanceolate.
    - Flowers wholly blue ... ... 10. polita
    - Lower lip white ... ... 9. agrestis.

1. V. scutellata Linn. *Marsh Speedwell.*

Bab. 261. Hook. 269. Benth. 349.

Boggy places. P. May to September.

Stems very brittle, slender, decumbent and rooting at the base, from 6 to 24 inches high; leaves long and narrow, pointed, sessile, sometimes with a few minute teeth on the edge, glabrous; flowers in lax racemes on alternate sides of the stem; corolla pale pink with darker lines; capsule two-lobed, flat; pedicels bent downwards in fruit.

Scarce.

I.—Golden Ball Hill, Overton, *Rev. J. Sowerby.*

II.—Bedwyn Common.

III.—Elcott Mill, *W. Mansell, Esq.*; Axford, *F. E. Thompson, Esq.*

2. V. Anagallis Linn. *Water Speedwell.*

Bab. 261. Hook. 270. Benth. 349.

Watery ditches. P. May to October.

Stems stout, hollow, succulent, rooting at the base, often as much as three feet high; leaves oblong-lanceolate, nearly entire, partially embracing the stem by their cordate bases, glabrous; flowers numerous, in opposite racemes; corolla flesh coloured; capsule with but a small notch at the top and only slightly compressed.

Common.

1865. ———	1869. May 27.	1873. June 10.
1866. ———	1870. May 28.	1874. June 12.
1867. ———	1871. May 17.	1875. June 1.
1868. May 19.	1872. June 15.	1876. June 10.

3. V. Beccabunga Linn. *Brook-lime.*

Bab. 262. Hook. 270. Benth. 349.

Watery places. P. May to Sep.

Stems stout, hollow, succulent, and rooting at the base, from one to two feet high; leaves stalked, oval, slightly crenate-serrate, glabrous; flowers not very numerous, in lax, opposite, racemes; corolla dark blue; capsule tumid.

Commonly distributed.

1865. May 13.	1869. May 19.	1873. May 31.
1866. June 6.	1870. May 17.	1874. May 31.
1867. May 23.	1871. May 9.	1875. May 22.
1868. May 10.	1872. May 5.	1876. May 20.

4. V. Chamædrys Linn. *Germander Speedwell.*

Bab. 262. Hook. 269. Benth. 350.

Hedgebanks. P. Ap. to Sep.

Stems wiry, decumbent and rooting at the base, then erect, with a line of long white hairs on each side; leaves nearly or quite sessile, ovate, deeply serrate; flowers in lax racemes, generally, but not always, opposite; corolla bright blue; style long; capsule half the length of the calyx, deeply notched, compressed, pubescent and with a row of hairs round the edge.

Very common.

1865. Ap. 27.	1869. Ap. 12.	1873. Ap. 19.
1866. Ap. 28.	1870. Ap. 17.	1874. Mch. 24, Ap. 1.
1867. Mch. 31, May 4.	1871. Ap. 18.	1875. full May 3.
1868. Ap. 1, 21.	1872. Mch. 12.	1876. Ap. 2, May 3.

5. V. montana Linn. *Mountain Speedwell.*

Bab. 262. Hook. 269. Benth. 349.

Moist shady woods and copses. P. May to July.

Bears some resemblance to the last, but differs in having rather less wiry stems, which are equally hairy all round; the leaves always stalked, the stalk being generally about half the length of the leaf; the racemes more lax; the corolla pale pink with darker lines; and the capsule very large and quite flat.

Scarce.

I.—Copse on the side of Martinsell; West Woods.

III.—Stitchcomb; Chilton Foliatt.

6. V. officinalis Linn. *Common Speedwell.*

Bab. 262. Hook. 269. Benth. 348.

Woods and heaths. P. June to Sep.

Also bears some resemblance to *V. chamædrys* in its prostrate, rooting stems, which remain decumbent throughout almost their whole length, and are uniformly hairy; leaves ovate, narrowing into a rather short stalk, and serrate on the edge; racemes many flowered, generally opposite; flowers on very short stalks; corolla lilac; style very long; capsule larger than the calyx, with a shallow notch at the top.

Common.

1865. June 12.	1869. June 10.	1873. June 5.
1866. June 19.	1870. June 3.	1874. June 12.
1867. ———	1871. June 12.	1875. June 5.
1868. ———	1872. May 9, June 11.	1876. June 6.

7. V. serpyllifolia Linn. *Thyme-leaved Speedwell.*

Bab. 263. Hook. 268. Benth. 348.

Fields and damp places. P. April to November.

Stems decumbent, much branched, forming dense patches; the flowering branches ascending, from 2 to 6 inches high, glabrous; leaves oval, shortly stalked, slightly crenate on the edge, gradually passing into bracts; flowers nearly sessile, in rather dense racemes; corolla whitish, with blue veins; style very long; capsule shorter than the sepals, glabrous.

Common.

1865. April 24.	1869. April 29.	1873. April 30.
1866. May 7.	1870. April 26.	1874. April 5.
1867. full May 6.	1871. April 25.	1875. May 10.
1868. April 9.	1872. March 3, 17.	1876. May 4.

8. V. arvensis Linn. *Wall Speedwell.*

Bab: 263. Hook. 268. Benth. 351.

Dry places, Wall-tops, &c. A. May to Nov. or Dec.

Stem erect, branched, but occasionally decumbent or rooting, hairy, from 2 to 6 inches long, though occasionally as much as a foot high; leaves ovate crenate, shortly stalked below, sessile above, and gradually passing into narrow strap-shaped bracts exceeding the flowers; corolla very small, pale blue with a white centre; capsule shorter than the sepals.

Common.

1865.	Seed May 25.	1869.	All the year.	1873.	May 4.
1866.	May 15.	1870.	May 19.	1874.	May 12.
1867.	April 28.	1871.	by May 2.	1875.	full May 13.
1868.	fl and seed May 19.	1872.	March 3, 17.	1876.	full June 15.

9. V. agrestis Linn. *Green Field Speedwell.*

Bab. 264. Hook. 267. Benth. 350.

Cultivated ground and waste places. A. All the year.

Stems prostrate, much branched from the base; leaves shortly stalked, ovate, crenate; "the lowest opposite, without flowers, but the greater number alternate, each with a pedicel in its axil, usually shorter than the leaf;" sepals oval; corolla blue, the lowest lobe always white; style short, scarcely projecting beyond the notch of the capsule; capsule of 2 turgid lobes, with a rather deep narrow notch between them and "a keel running round the whole of the outside, the surface with rather prominent veins, and sparingly clothed especially along the keel) with short gland-tipped hairs." Seeds 4—6 in a cell.

Common.

1865.	April 26.	1869.	All the year.	1873.	March 25.
1866.	fl. and seed, Feb. 17.	1870.	April 22.	1874.	April 1.
1867.	———	1871.	March 18.	1875.	———
1868.	fl. and seed, Feb. 13.	1872.	March 4.	1876.	———

10. V. polita Fries. *Gray Field Speedwell.*

Bab. 264. Hook. 267. Benth. 350.
(V. agrestis).

Cultivated ground and waste places. A. All the year.

Approaches very closely to *V. agrestis* (in fact the two are united by Bentham and Hooker), and it is certainly difficult at times to separate them. I have therefore made very free use of Dr. Syme's descriptions, which

are very full and distinct. The general appearance of the plant is like that of *V. agrestis*, but *V. polita* is always a smaller plant; the leaves close together, with deeper and sharper serratures; pedicels usually as long as or longer than the leaves; sepals broadly ovate, acute and more conspicuously varied; corolla wholly blue; style elongated, protruding beyond the notch of the capsule; capsule of 2 turgid lobes, with a shallow notch between, without keel or prominent veins, and downy with short simple hairs intermixed with grand-tipped ons. Seed 8—10 in each cell.

Very common.

This species with *V. agrestis* and *V. Buxbaumii* may generally be found in flower all through the winter.

11. V. Buxbaumii Ten. *Buxbaum's Speedwell.*

Bab. 264. Hook. 267. Benth. 351.

Cultivated ground. A. All the year.

Similar to the two last, but is generally a very much larger and stouter plant. The pedicels are much longer than the leaves; the sepals lanceolate, acute, in two pairs; the corolla bright blue, as large as those of *V. Chamædrys*; the capsule is much larger, the lobes attenuated into a sharp keel, with the notch between them forming a very obtuse angle; the surface nearly glabrous, except at the top, and with a very evident network of raised lines.

Very common.

Generally lasts throughout the year.

12. V. hederifolia Linn. *Ivy-leaved Speedwell.*

Bab. 264. Hook. 267. Benth. 350.

Cultivated ground. A. Jan. to July and again in Oct. and Nov.

Stems prostrate, much branched from the base; from 6 to 18 inches long leaves stalked, broadly ovate, with 5—7 lobes, the terminal one largest. Flowers in the axils of the leaves; the pedicels ultimately longer than the leaves; sepals broad, cordate at the base, glabrous, but ciliate on the edge; corolla very small, pale blue; capsule of 2 turgid lobes, without keel or prominent veins, and glabrous. Seeds 2 in each cell.

Very common.

1865. Full April 4.	1869. Feb. 16.	1873. All the year.
1866. Feb. 20.	1870. Feb. 8.	1874. All the year.
1867. Feb. 14.	1871. Feb. 18.	1875. Feb. 25.
1868. Feb. 13.	1872. Feb. 7.	1876. by Feb. 2.

50. LABIATÆ.

A very well marked order, though the genera are very difficult to discriminate. Many of the plants have creeping root-stocks; stems quandrangular; leaves opposite; flowers solitary in the axils of the leaves, or more frequently in small dense cymes, so packed that they appear to be in whorls: besides the two leaves there are also in many cases, small bracts under each flower; calyx five-toothed, sometimes two-lipped; corolla with a distinct tube and two-lipped, the upper lip composed of two petals, which are sometimes so small as to appear wanting, the lower lip of three petals; stamens two or four in two pairs, one pair longer than the other, often parallel to one another, but sometimes diverging, *i.e.*, pointing in different directions; ovary of two carpels, each carpel divided into two, so that the ovary appears four-lobed, with a single style rising from the centre, and cleft at the top.

From the structure of the fruit it resembles Boraginaceæ, with its four single seeded "nuts," but differs from that order in its square stems, opposite leaves, irregular flowers, and only (two or) four stamens.

It is very difficult to form a table of genera, without making use of characters, either indistinct to beginners, or barely applicable to the whole genus. The following is believed to be correct, though it is very possible that it may require modification.

Stamens 2.
- Corolla nearly regular ... ... 2. Lycopus.
- Corolla 2-lipped ... ... 3. Salvia.

Stamens 4.
- Stamens diverging, nearly equal.
  - Corolla bell-shaped, nearly regular ... 1. Mentha.
  - Corolla somewhat 2-lipped.
    - Calyx with 5 equal teeth ... ... 4. Origanum.
    - Calyx 2-lipped ... ... 5. Thymus.
- Stamens parallel, 2 longer than the others.
  - Upper lip of corolla very short.
    - Upper lip with 2 teeth ... ... 14. Teucrium.
    - Upper lip nearly or quite entire ... 15. Ajuga.
  - Corolla 2-lipped.
    - Calyx obviously 2-lipped.
      - Both lips entire ... ... 7. Scutellaria.
      - Upper lip 3-toothed.
        - Filaments bifid ... ... 8. Prunella.
        - Filaments not bifid ... ... 6. Calamintha.
    - Calyx not obviously 2-lipped.

Calyx with 5 equal teeth, or very nearly so.
Anthers hairy ... ... 11. Galeopsis.
Anthers glabrous.
Calyx teeth broad, spreading ... 13. Ballota.
Calyx teeth narrow, not spreading 12. Stachys.
Calyx with 2 teeth longer.
*Anthers hairy ... ... 10. Lamium.
Anthers glabrous ... ... 9. Nepeta.

1. Mentha Linn.

Herbs with creeping root-stocks and capable of accommodating themselves to a variety of situations, causing a great variety in the hairness of some species. Flowers in clusters, forming dense rings round the upper joints of the stem, or terminal heads, the leaves springing from these joints similar to the other leaves of the plant, or smaller. Corolla bell-shaped, nearly regular; stamens four, nearly equal.

Only six species have as yet been satisfactorily detected near Marlborough.

Throat of calyx hairy ... ... 6. Pulegium.
Throat of calyx glabrous.
Whorls of flowers in terminal heads or spikes, bracts minute.
Leaves sessile or very nearly so.
Leaves roundly ovate, wrinkled ... 2. rotundifolia.
Leaves lanceolate, not wrinkled ... 1. viridis.
Leaves stalked ... ... 3. aquatica.
Whorls of flowers in axillary clusters, shorter than the leaves, bracts like the leaves.
Calyx bell-shaped, leaves stalked ... 5. arvensis.
Calyx tubular, leaves sessile ... ... 4. sativa.

1. **M. viridis** Linn. *Spear Mint.*
Bab. 267. Hook. 279. Benth. 360.
Waste places. P. August.

Leaves sessile, lanceolate, serrate, and glabrous, very pungent, whorls of flowers rather distant; bracts awl-shaped, projecting beyond the whorls. This is the common mint of gardens, and is evidently only an escape near Marlborough.

(* Lamium Galeobdolon has glabrous anthers, but its bright yellow colour will serve to distinguish this species).

2. **M. rotundifolia** Linn. *Round-leaved Mint.*

Bab. 268. Hook. 279. Benth. 360.

Waste places. P. July to October.

Leaves sessile, roundly ovate, crenate, much wrinkled, from the veins being much impressed above and prominent beneath, slightly hairy above, shaggy beneath. Whorls of the spike nearly close together; bracts resembling the leaves, but much smaller, the upper ones minute. Flowers white or pale pink.

A form with variegated leaves is not uncommon in gardens.

Only occurs in a hedge near the Brick Pits on the Pewsey Road.

3. **M. aquatica** Linn. *Capitate Mint.*

Bab. 268. Hook. 280. Benth. 361.

Wet places. P. July to October.

A very variable plant, but known by its stalked, oval leaves, and its whorls of flowers collected into dense terminal heads. It varies greatly in the amount of pubescence, as well as in the height of the stems, from six inches to five feet (according to Dr. Syme.)

Common.

1874. July 22. 1875. —— 1876. August 4.

4. **M. sativa** Linn. *Whorled Mint.*

Bab. 269. Hook. 280. Benth. 361.

Wet places. P. July to October.

A very variable plant; in fact some specimens approach so nearly to *M. aquatica* that some botanists unite the two. The main point of distinction is in the flowers not being crowded into heads, but in axillary clusters; the plant is less erect than *M. aquatica*, and not so high, with the stems more decumbent and spreading. On the other hand it also approaches closely to the next, especially in its habit; the main distinction being in the calyx, which is tubular, with narrow, pointed teeth, whereas in *M. arvensis* it is truly campanulate, with broad short teeth.

Not common.

5. **M. arvensis** Linn. *Corn Mint.*

Bab. 269. Hook. 281. Benth. 361.

Corn Fields. P. July to October.

See remarks on the two preceding species. It is an equally variable species, but it is usually of a low, spreading growth; the truly campanulate calyx series as a certain difference.

Common.

1874. July 31. 1875. July 22. 1876. July 31.

6. M. Pulegium Linn. *Penny-royal.*

Bab. 269. Hook. 281. Benth. 362.

Wet Places P. Aug. to October.

Very different in appearance from the other members of the Genus, being a low spreading plant, with small leaves, the flowers crowded into dense whorls, as in *M. arvensis*; and the throat of the calyx hairy.

Only occurs in a pond near the top of Martinsell, *Rev. J. Sowerby.*

2. Lycopus Linn.

1. L. europæus. Linn. *Gipsywort*

Bab. 269. Hook. 282. Benth. 359.

Banks of streams and ditches. P. Aug. to Oct.

A plant with very much the appearance of a mint, in its square creeping stems, and small flowers crowded into whorls; the stems are, however, very slightly hairy, the leaves very broadly and deeply serrate, sometimes pinnatifid in their lower part, and the flowers have only 2 stamens. Corolla small, bluish white, with a few spots.

Not common.

I.—By the Canal; Draycot; New Mill; Preshute.

II.—Bedwyn.

III.—Mildenhall; Axford; Ramsbury.

3. Salvia. Linn.

1. S. Verbenaca. Linn. *Clary.*

Bab. 270. Hook. 284. Benth. 358.

Dry banks P. May to September.

Stems from 1 to 2 feet high, with a tuft of leaves at the base, and a few straggling rather wiry branches in its lower part. Leaves ovate, blunt, wrinkled; the lower stalked, the upper sessile; flowers in distant whorls, with a pair of broad, ovate, bracts beneath each whorl. Corolla blue, not twice as long as the Calyx; stamens 2.

Has been found only on the road side at Axford, where it has established itself.

1865. May 14.	1869.————	1873. May 10.
1866. bud. May 16	1870. May 14.	1874. by May 30.
1867.————	1871. May 12. (cult.)	1875. full June 5.
1868. by May 28.	1872. May 2. (cult.)	1876. June 11.

4. Origanum Linn.

1. O. vulgare. Linn. *Marjoram.*

Bab. 270. Hook. 282. Benth. 363.

Dry places P. July to October.

Rootstock perennial, shortly creeping; stems numerous, from 1 to 2 feet high, branched above. Flowers in small, dense, heads and so arranged at the ends of the branches that the whole form a crowded panicle. Flowers with a leaf-like purple bract under each; corolla purplish pink, sometimes white.

Not common.

I.—New Mill, *Rev. J. Sowerby*; Martinsell; White Horse Down.

II.—Near Bedwyn, *Rev J Sowerby.*

III.—Mildenhall Borders (and white variety).

5. Thymus Linn.

1. T. Serpyllum. Linn. *Thyme.*

Bab. 270 Hook. 282. Benth. 362.

Dry banks and pastures. P. June to October.

Stems hard, prostrate, much branched, and forming tufts, often a foot in diameter; leaves small, oval, narrowed into short stalks with a fringe of hairs; whorls of flowers crowded into terminal heads, with often several separated whorls beneath. Calyx closed at the mouth with numerous white hairs. Corolla rosy purple, upper lip deeply notched, lower lip slightly longer.

Very common.

1865. Bud. June 3. May 11 at Silbury.	1869. June 5.	1873. June 8.
1866. June 4.	1870. May 26.	1874. May 31.
1867. May 29.	1871. June 1.	1875. June 3.
1868. May 31.	1872. June 4.	1876. June 10.

2. T. Chamædrys. Fries.

Bab. 271. Hook. 283. Benth. 362.

Dry banks and heaths *T Serpyllum.*

Very similar to the last and unless seen growing, very difficult to distinguish between the two. In *T. Serpyllum*, the plant grows in flakes with the barren stems extending beyond the flowering ones, and forming a fringe round them; whilst *T. Chamædrys* grows in a tuft with the flowering shoots far exceeding the barren ones, as the stem of the preceding year terminates in a flowering and not in a barren shoot. The flowering shoots of *T. Chamædrys* are generally much longer, with the pubescence confined to 2

or 4 strips; the leaves are generally larger, broader in proportion, and less narrowed at the base; the inflorescence is less capitate, from the whorls being more numerous and continued further down the stem; the flowers are generally larger than in *T. Serpyllum* and have the upper lip of the corolla shorter and more rounded. The plant varies from sub-glabrous to hairy.

The above description is taken from Dr. Syme's, as I have never but once met with the plant, and never discovered that it was the true Chamædrys till after it had been dried. That specimen was found on Avebury Down, in 1871, and I have never been satisfied that I have really met with the species since.

6. Calamintha Mœnch.

Annual or perennial herbs with branched or solitary stems, decumbent at the base; calyx with 13 nerves and 2-lipped, the upper with 3 teeth; corolla 2-lipped; stamens 4, in pairs under the upper lip. "It is distinguished from *Thymus* and *Origanum* chiefly by the longer corolla and the stamens diverging, from all the following genera by the arrangement of the ribs or nerves of the calyx (two between the midribs of the lower teeth and one only between the midribs of the upper teeth)" (*Bentham*).

Annual; calyx tube swollen at the base; flowers 6 in a whorl ... ... 2. Acinos.

Perennial; calyx tube not swollen at the base; whorls of many flowers, bracts very narrow and numerous... ... ... 3. Clinopodium.

Whorls of 2 forked cymes, bracts few, minute ... ... 1. officinalis.

1. C. officinalis Mœnch? *Common Calamint.*

Bab. 271. Hook. 283. Benth. 364.

Roadsides. P. July to October.

Rootstock more or less creeping; stem from 1 to 2 feet high, with straggling branches; leaves stalked, ovate, slightly serrate on the edge; flowers usually in pairs of axillary cymes of 6 to 10 flowers each, (but variable in this respect) and usually turned to the same side; calyx distinctly 2 lipped; corolla white, speckled with lilac on the lower lip.

Very scarce—Mildendall, *Rev. J. J. Pulleine*; Axford.

1874. about July 13. 1875. July 22. 1876. July 29.

2. C. Acinos Clairv. *Basil.*

Bab. 272. Hook. 284. Benth. 364.

Dry banks and fields. A. June to September.

An annual, from 6 to 18 inches high, with numerous wiry stems springing from the root, rarely from the main stem; leaves ovate, pointed, obscurely serrate and with the edges rolled back; flowers pale purple in axillary whorls of about 6 flowers, (each flower on a separate peduncle), and without bracts; calyx swollen at the base, strongly ribbed and distinctly 2-lipped.

Not common.

I.—Clatford Bottom

II.—Little Bedwyn, *E. F. im Thurn, Esq.*

1870.	July 4.	1874.	July 6.
1872.	May 25. (cult.)	1875.	———
1873.	June 15. (cult.)	1876.	July 4.

3. C. Clinopodium Benth. *Wild Basil.*

Bab. 272. Hook. 284. Benth. 364.

Hedges and roadsides. P. July to November.

Rootstock shortly creeping; stems erect, from 1 to 2 feet high, mostly simple, covered, as well as the leaves, with soft hairs; leaves ovate, stalked, slightly crenate; flowers in 2 or 3 dense whorls, the uppermost terminal.

Common.

1870.	June 21.	1875.	June 17.
1873.	July 10.	1876.	July 11.
1874.	July 13.		

7. Scutellaria Linn.

Herbs with creeping rootstocks, and slightly branched stems; flowers solitary in the axil of each leaf, in distinct axillary pairs, forming terminal spikes; calyx with 2 lips, both entire, (the upper one with a scale-like protuberance), and closing after flowering; tube of corolla long.

Stems above 6 inches high, flowers large, blue ... 1. galericulata.

Stems under 6 inches high, flowers small, pink ... 2. minor.

1. S. galericulata Linn. *Skull-cap.*

Bab. 272. Hook. 286. Benth. 366.

Banks of ditches and streams. P. June to September.

Stems from 6 inches to 1 foot high; leaves nearly sessile, broadly lanceolate, crenate; flowers all turned the same way, pubescent, corolla bluish purple, 3 or 4 times as long as the calyx.

Not common.

I.—New Mill; Wilcot, *Rev. J. Sowerby*; Woodborough.

II.—Bedwyn; Chisbury.

III.—Axford; Mildenhall, *F. E. Thompson, Esq.*

1870. June 18. 1873. by July 1. 1874. by July 4.

2. S. minor Linn. *Lesser Skull-cap.*

Bab. 273. Hook. 287. Benth. 367.

Boggy places. P. July to September.

Stems seldom above 6 inches high, and then only when growing among grass, when according to Dr. Syme, it is sometimes as much as a foot high, often much branched. Leaves broader than in *S. galericulata*, the lower ones sometimes having a lobe on each side; flowers pink.

Found this year in Stype Wood by *E. F. im Thurn, Esq.*

8. Prunella Linn.

1. P. vulgaris Linn. *Self-heal.*

Bab. 273. Hook. 286. Benth. 366.

Pastures and waste places. P. June to October.

Rootstock creeping; stems from 3 inches to nearly a foot high; leaves ovate, nearly entire, lower stalked, upper sessile; flowers in whorls of about 6, with a broad bract under each whorl, collected into, dense terminal spikes, at first very short, but afterwards lengthening out, and with a pair of leaf-like bracts close under each head; calyx 2-lipped, closed in fruit, upper lip flat; corolla deep violet blue, rarely white or pink; stamens 4, filaments bifid at the top, one branch barren. The whole plant frequently tinged with purple.

Common.

1865. June 11.	1869. bud June 16.	1873. June 23.
1866. ———	1870. June 6.	1874. June 12.
1867. ———	1871. by June 24.	1875. June 12.
1868. June 11.	1872. June 21.	1876. June 27.

9. Nepeta Linn.

The two species of this genus are so different in appearance that they have been sometimes placed in separate genera.

Stems erect, whorls of flowers collected into dense terminal spikes ... ... 1. Cataria.

Stems trailing, whorls of flowers axillary, few flowered ... ... 2. Glechoma.

1. N. Cataria Linn. *Cat-Mint.*

Bab. 273. Hook. 285. Benth. 365.

Hedges. P. July to October.

Stems erect, stout, two to three feet high, downy, branched, leafy; leaves stalked, cordate, acute, with large deep serratures, whitish beneath. Flowers in dense whorls, crowded into spikes at the ends of the branches, the lowermost whorls often rather distant; corolla rather small, whitish with purple dots, its tube a little longer than the pubescent calyx.

Very scarce.

Hedge on the side of the Bath Road near Manton, *Rev. J. Sowerby*; Axford. *F. E. Thompson, Esq.*

2. N. Glechoma Benth. *Ground-Ivy.*

Bab. 273. Hook. 286. Benth. 365.

Hedges and waste places. P. March to July.

Stems slender, procumbent, often creeping to a considerable length; flowering stems erect, from three to twelve inches high; leaves reniform, with a deeply cordate base, strongly crenate on the edges, and on long stalks; flowers in axillary whorls of three to six, all turning the same way; corolla purplish blue, variable in size, but with the tube at least twice as long as the calyx.

Very abundant.

1865. Ap. 9.	1869. Mch. 3, 25.	1873. Mch. 17.
1866. Mch. 24.	1870. Mch. 23.	1874. Mch. 6, 17.
1867. bud Mch. 26.	1871. Mch. 25.	1875. Ap. 2.
1868. Mch. 14.	1872. Mch. 4.	1876. Mch. 15, Ap. 1.

10. Lamium Linn.

Herbs with erect succulent stems, decumbent at the base, and, in the perennial species, extensively creeping. Lower leaves always stalked, ovate, upper often sessile. Flowers crowded into axillary whorls, or the upper ones in a leafy head. Anthers hairy, except in *L. Galeobdolon*. "Generally distinguished by the long, arched, upper lip, or by the smallness of the lateral lobes of the lower lip of the corolla" (Bentham), which in this genus are often reduced to small teeth.

Annuals; flowers pink, in terminal, leafy, whorls.

Upper leaves sessile, broadly cordate, deeply crenate ... ... 1. amplexicaule.

Upper leaves not sessile, cordate, generally pointed.

Floral leaves crenate, not cut	3. purpureum.
Floral leaves deeply crenate	2. incisum.
Perennials; flowers white, lower lip of one large lobe and one or two side teeth...	4. album.
flowers yellow, lower lip of three nearly equal lobes	5. Galeobdolon.

1. L. amplexicaule Linn. *Henbit.*

Bab. 274. Hook. 292. Benth. 372.

Cultivated fields. A. All the year.

Stems several from the crown of the root, decumbent at the base, with upright single branches from the axils of the lower leaves; lower leaves broadly cordate, stalked; upper leaves still broader and sessile, touching one another on each side of the stem, and in the axils of which are the whorls of flowers; the stems have a very naked appearance from their having one or two whorls of flowers near to one another at the top, and but one or two throughout the rest of the stem, which is from six to twelve inches high; corolla bright purplish pink, much longer than the calyx, both of which are softly hairy. The corolla very frequently does not expand, and thus appears as a small bright pink spot inside the calyx, the anthers, however, are fertile, and the fruit is produced.

Distributed.

1865. by Ap. 17.	1869. Ap. 21.	1873. May 2.
1866. Ap. 28.	1870. all the year.	1874. all the year.
1867. ———	1871. (Feb. 28), Ap. 6.	1875. full May 3.
1868. Ap. 26.	1872. Mch. 1, 16.	1876. June 10.

2. L. incisum Willd. *Cut-leaved Dead-Nettle.*

Bab. 274. Hook. 291. (*L. hybridum.*) Benth. 373. (*L. purpureum*).

Cultivated ground. A. April to June.

Stems from three to eighteen inches high, succulent, decumbent at the base; leaves cordate, deeply and irregularly crenate, the lowest pair of floral ones shortly stalked, the upper ones becoming more and more sessile and crowded at the ends of the stems, but none of the pairs overlapping at their bases; corolla pink, about half an inch long, the tube without an evident ring of hairs inside.

Very scarce.

Has been found at Pewsey, by *F. J. H. Jenkinson*; and at Mildenhall by *F. E. Thompson, Esq.*

3. L. purpureum Linn. *Red Dead-Nettle.*

Bab. 274. Hook. 291. Benth. 373.

Cultivated and Waste Ground. A. All the year.

A variable plant and similar in many respects to the former; in fact Hooker and Bentham consider *L. incisum* as but a variety of *purpureum*. The ordinary form of this plant is easily distinguished from *L. incisum* by its faintly crenate floral leaves; (but the crenatures are very variable one form, *decipiens*, being very similar in this respect to *incisum*) and the longer corolla with a *distinct* ring of hairs inside will serve to separate the two.

This plant may be found in flower throughout the winter; in ordinary years it is most scarce during July and August.

4. L. album Linn. *White Dead-Nettle.*

Bab. 274. Hook. 292. Benth. 373.

Hedges and Waste Places. P. All the year.

Rootstock much branched, creeping, and sending out long stolons. Stems decumbent at the base, from six inches to two feet high, covered with reflexed hairs. Leaves stalked, cordate, pointed, strongly serrate, hairy. Flowers in whorls of from 6 to 18 flowers. Corolla white, hairy, much longer than the calyx, the tube of which is spotted with dark purple. Inside the tube of the corolla is a ring of hairs, below which the tube is much contracted.

Very abundant.

1865. April 13.	1869. April 20 (all the year).	1873. All the year.
1866. April 1.	1870. March 27.	1874. All the year.
1867. bud April 7.	1871. March 12, 31.	1875. April 4.
1868. March 3.	1872. All the year.	1876. April 5.

This and the two preceding last throughout the winter, unless it is very severe; consequently the above dates are those when the young shoots of the year seem to have flowered.

6. L. Galeobdolon Crantz. *Archangel.*

Bab. 275. Hook. 292. Benth. 373.

Hedges and thickets P. April to June.

Rootstock very shortly creeping, and sending out long barren trailing shoots; stems from 6 to 18 inches long; leaves stalked, ovate, coarsely serrate; whorls of from six to ten flowers; corolla bright yellow, with the lower lip spotted with darker; lower lip of three nearly equal lobes; anthers glabrous.

Common.

1865.	April 25.	1869.	April 23.	1873.	May 4.
1866.	April 30.	1870.	April 26.	1874.	April 16.
1867.	April 27.	1871.	April 25.	1875.	May 8.
1868.	April 10.	1872.	April 30.	1876.	April 30.

11. Galeopsis Linn.

Annuals, distinguished from *Lamium* principally by the calyx, which consists of five equal teeth; by the lower lip of the corolla, which consists of three lobes; and by the bursting of the anthers transversely, not longitudinally. Our two Marlborough species are easily distinguished.

Hairs soft; stem not swollen under the joints, calyx teeth not longer than the tube ... ... 1. Ladanum.

Hairs long and stiff; stem swollen beneath the joints, calyx teeth, long ... ... 2. Tetrahit.

1. G. Ladanum Linn. *Iron Wort, Red Hemp-Nettle.*

Bab. 275. Hook. 289. Benth. 370.

Cultivated fields. A. July to October.

Stems from 6 to 12 inches high, much branched, not thickened under the joints, and soft with deflexed hairs; leaves varying from ovate lanceolate to narrow lanceolate in different specimens, entire or slightly toothed; flowers in dense whorls in the upper part of the stem, the highest forming a teminal head. Corolla rose-purple, the lower lip with white markings, very conspicuous.

Common.

1865.	June 18.	1873.	June 28.	1875.	July 10.
1870.	July 2.	1874.	July 31.	1876.	August 4.

2. G. Tetrahit Linn. *Wild Hemp, Common Hemp-Nettle.*

Bab. 276. Hook. 290. Benth. 371.

Cultivated and Waste Ground. A. July to November.

A much taller and coarser plant than the last; stems from 1 to 2 feet high, swollen beneath the joints, especially the lower ones, and covered with long stiff hairs; leaves stalked, ovate, coarsely serrate; flowers arranged as in the last species; calyx with long stiff spreading almost prickly teeth; corolla variable in size and colour, purplish or yellow, with white or purple markings.

Common.

1870. June 21.	1875. July 6.
1873. July 7.	1876. July 31.
1874. July 4.	

12. Stachys Linn.

We have but four species occurring about Marlborough, all very different in appearance and easily distinguishable.

Whorls of flowers forming an interrupted spike or raceme.

Annual; 6 to 18 inches high, flowers small ... 4. arvensis.

Perennial; stems 1 to 4 feet high, flowers conspicuous.

Leaves broadly cordate, lower long-stalked ... 2. sylvatica.

Leaves long and narrow, sessile or shortly stalked 3. palustris.

Whorls of flowers forming a short dense terminal spike 1. Betonica.

1. S. Betonica Linn. *Betony.*

Bab. 276. Hook. 289. Benth. 368.

Woods and thickets. P. June to October.

Stems 6 to 18 inches high, simple or rarely branched from the base, downy or hairy; radical leaves ovate, crenate, on long stalks, mostly radical or on the lower part of the stem, becoming longer and narrower, more serrate on the edges, and more nearly sessile as they ascend the stem; flowers in dense whorls at the ends of the stems, forming a spike or head or more or less interrupted below: lowest bracts leaflike, upper minute; corolla purplish red.

Common.

1865. June 22.	1869. bud June 16.	1873. July 8.
1866. ———	1870. June 21.	1874. July 6.
1867. ———	1871. ———	1875. June 17.
1868. June 1, (Chisledon).	1872. ———	1876. July 5.

2. S. sylvatica Linn. *Hedge Wound-wort.*

Bab. 277. Hook. 288. Benth. 369.

Damp hedges and shady places. P. June to Nov.

Rootstock extensively creeping; stems two to four feet high, erect, branched; leaves all stalked, broadly cordate, pointed, hairy, serrate; whorls six to eight flowered with a pair of floral leaves under each, similar to, but smaller than the other leaves, and forming a long terminal raceme; bracts minute; corolla dark reddish purple; the whole plant with a strong disagreeable smell.

Common.

1865. June 8.	1869. June 10.	1873. June 13.
1866. June 11.	1870. June 5.	1874. June 6.
1867. June 14.	1871. June 1.	1875. June 9.
1868. May 31.	1872. June 4.	1876. June 19.

3. S. palustris Linn. *Marsh Wound-wort.*

Bab. 277. Hook. 288. Benth. 369.

River-sides and damp places. P. July to Oct.

Similar in many respects to the last; the rootstock more extensively creeping; stems from one to three feet high; leaves longer and narrower, almost or quite sessile, with the margins not so strongly serrate, "the radical leaves not persistent at the time of flowering" (Syme); and the corolla purplish rose with white markings on the lower lip; the spikes are also more crowded and shorter, and the smell not so strong.

Common.

1870. July 2.	1875. July 22.
1874. July 1.	1876. July 1.

4. S. arvensis Linn. *Corn Wound-wort.*

Bab. 277. Hook. 289. Benth. 370.

Corn-fields. A. Aug. to Oct.

A slender annual, from four to twelve inches long, with numerous spreading hairy branches, especially from the lower part, often decumbent; leaves all stalked, ovate, serrate, becoming narrower and shorter stalked as they ascend the stem; flower spike very lax, often occupying half the length of the stem; flowers small, the corolla scarcely exceeding the calyx; pale rose, variegated with white.

Not common.

Near Aldbourne, *Rev. J. Sowerby.*

13. Ballota Linn.

1. B. fœtida Lam. *Black Horehound.*

Bab. 277. Hook. 292. Benth. 371.

Hedges and roadsides. P. June to Nov.

A very coarse, strong smelling plant, covered with a soft pubescence; stems bluntly quadangular, branched, flexuous; leaves stalked, broadly cordate or ovate, irregularly crenate or serrate; cymes shortly stalked and often turned the same way, often not much longer than the leaf stalks; calyx funnel shaped with ten prominent ribs and five broad teeth, the midribs of the sepals forming a projecting spine at the top of each tooth; corolla about

twice the length of the calyx, purplish rose, variegated with white on the lower lip.

Widely distributed, but not common.

1866. bud Ap. 30.	1869. bud June 10.	1874. June 20.
1867. bud June 16.	1870. June 21.	1875. July 8.
	1873. July 8.	1876. July 11.

14. Teucrium Linn.

1. T. Scorodonia Linn. *Wood-Sage.*

Bab. 278. Hook. 293. Benth. 374.

Heaths and copses. P. July to Sept.

Rootstock creeping, woody; stems from one to two feet high, rigid, almost woody, slightly branched; leaves all stalked, more or less heart-shaped, (sometimes more than twice as long as broad) crenate or serrate, much wrinkled, darkish above, paler beneath with a dense pubescence; flowers in pairs, turned the same way, and arranged in racemes at the ends of the stems and branches. Calyx with five teeth, the upper one much larger than the others; corolla twice as long as the calyx, pale yellow, the upper lip reduced to two small teeth; stamens projecting beyond the corolla.

Very scarce. Has been found at Oare, Bedwyn and near Savernake, by *Rev. J. Sowerby*. One plant has also been found in a hedge near Pentawick.

15. Ajuga Linn.

1. A. reptans Linn. *Bugle.*

Bab. 279 Hook. 294. Benth. 375.

Open woods, pastures, &c. P. Ap. to July.

Rootstock with a rosette of leaves and emitting long trailing shoots with one or two pairs of leaves and a terminal rosette, similar to the primary one, and also a few upright flowering stems about four inches high, but lengthening to as much as a foot by the time the plant has done flowering; leaves oval, more or less irregularly crenate, sessile in the upper part of the stem, but narrowed into a long stalk, (about as long as the blade) in the lower part; whorls of flowers forming a leafy spike, dense at first, but becoming more lax as the plant continues to flower; corolla much longer than the calyx, blue, rarely white or flesh coloured, the upper lip very small, and a ring of hairs within. The whole plant often has a purplish tinge, and is very nearly glabrous; the stem has a line of hairs down each side, the leaves and bracts also are ciliated, and, when young, often have scattered hairs on each side.

Common.

1865. April 29.	1869. April 26.	1873. May 5.
1866. May 5.	1870. April 26.	1874. April 27.
1867. May 4.	1871. April 25.	1875. May 10.
1868. April 28.	1872. April 15.	1876. April 16.

11. VERBENACEÆ.

Differs from Labiatæ principally in the structure of the ovary, which is entire, and when ripe, separates into four nuts, with one seed in each. The style rises from the top of the ovary, whereas in Labiatæ it passes between the nuts and is attached to them at their base.

1. Verbena Linn.

1. V. officinalis Linn. *Vervain.*

Bab. 279. Hook. 295. Benth. 376.

Waste ground. P. July, August.

Stems from 1 to 2 feet high, quadrangular, rather hispid, with pairs of stiff wiry branches; leaves oval in outline, lobed and serrate, the two lower lobes much larger, so that the leaf is almost trifid, flowers in spikes at the ends of the stems and branches, the spikes short at first, but afterwards lengthening out; corolla 5 cleft, small, pale purple.

Scarce. It appears in a locality for a year or two and then vanishes. Has occurred at Chisbury; Bedwyn; Mildenhall; Axford; and near Marlborough, in Sun Lane.

1865. June 27.	1873. July 27.
1870. June 28.	1874. July 22.

52. PRIMULACEÆ.

This order is but very poorly represented near Marlborough; and consequently the remarks made upon it will refer only to Marlborough plants. The species are low herbs, with all the leaves radical, or in pairs on the stem. Corolla regular, 5 lobed; stamens 5, and (what is peculiar in this order) are situated *opposite* the lobes of the corolla, not alternate with them; fruit a capsule, opening either by teeth at the summit, or dividing into two halves, the upper one falling off; seeds attached to a free central placenta, so that the ovary is 1-celled.

Capsule opening by valves, flowers yellow.

Tube of corolla long, leaves radical ... ... 1. Primula.

Tube of corolla short, leaves cauline ... ... 2. Lysimachia.

Capsule opening transversely, flowers red or blue... 3. Anagallis.

1. Primula Linn.

Rootstock stout, covered with the fleshy bases of the old leaves, often branched; leaves all radical; flowers in umbels, the main stalk in *P. vulgaris* being generally undeveloped, so that the separate flower stalks appear to spring directly from the root; flowers dimorphic, *i.e.*, presenting two distinct forms, one with the style longer than the stamens, so that the tube of the corolla is closed by the globular stigma (commonly called pin-eyed), the other with the style shorter than the stamens, the anthers therefore form a conical covering over the mouth of the tube (and called thumb-eyed).

We have about Marlborough only the Primrose (*P. vulgaris*) and the Cowslip (*P. veris*), but hybrids occur not uncommonly, which are often called Ox-lips, but are not the *true* Oxlip. These intermediate forms are very varied, sometimes having flowers almost like those of *P. vulgaris* and sometimes more like those of *P. veris*. Dr. Syme believes that the main-stalk (scape) in *P. vulgaris* is never developed, however much the flowers resemble those of the ordinary plant, as this form never occurs where *P. veris* does not grow. Bentham considers *P. vulgaris* is and *P. veris* as the same species and therefore unites them.

1. P. vulgaris Huds. — *Primrose.*

Bab. 283. — Hook 299. — Benth 301. (*P. veris.*)

Woods, pastures, hedgebanks. — P. Feb. to June.

Leaves ovate, tapering at the base into a winged foot-stalk, wrinkled, crenate; flowers large, the limb flat, on hairy stalks, which spring from the same point of the root-stock, thus forming an umbel with a very short scape.

Very common.

1865. April 1.	1869. June 17, Feb. 18.	1873. Feb. 14.
1866. April	1870. Feb. 22.	1874. All the year.
1867. By Feb. 11.	1871. Feb. 21.	1875. Jan. 11.
1868. ———	1872. Feb. 9.	1876. Feb. 5.

A few flowers are occasionally found as early as September.

2. P. veris Linn. — *Cowslip.*

Bab. 283. — Hook. 299. — Benth. 301.

Meadows and pastures. — P. March to June.

Leaves ovate, abruptly contracted below into winged petioles, wrinkled, crenate; flowers much smaller than in *P. vulgaris*, the limb concave, and of a darker colour, arranged in umbels at the tops of long scapes which lift them above the leaves.

Very common

1865. April 7.	1869. Feb. 27, Mch. 20.	1873. Mch. 26, Ap. 6.
1866. April 5.	1870. Ap. 3, 10.	1874. April 5.
1867. Mch. 30, Ap. 5.	1871. Mch. 26.	1875. Feb. 4, Ap. 17.
1868. April 5.	1872. Mch. 8, 19.	1876. Ap. 3, 16.

2. Lysimachia Linn.

The only two species of this genus occurring near Marlborough have weak, prostrate, or trailing stems, with solitary flowers in the axils of the leaves.

Flowers large, filaments glandular, sepals broad... ... 1. Nummularia.
Flowers small, filaments smooth, sepals narrow ... ... 2. nemorum.

1. L. Nummularia Linn. *Moneywort, Creeping Jenny.*

Bab. 285. Hook. 301. Benth. 304.

Damp places. P. June to Sept.

Stems prostrate, rooting, often 1 or 2 feet long; leaves oval, broad, almost entire, shortly stalked; flowers solitary, occasionally in pairs; corolla bright yellow.

Distributed, but not common.

1865. about June 17.	1872. June 24.	1875. June 19.
1870. June 23.	1873. June 26.	1876. July 3.
1871. about June 21.	1874. June 30 (cult).	

2. L. nemorum Linn. *Yellow Pimpernel.*

Bab. 285. Hook. 301. Benth. 304.

Damp woods. P. May to July.

Stems prostrate, 3 to 12 inches long; leaves ovate, acute, stalked; flowers solitary, yellow. It has the habit and appearance of *Anagallis*, but the capsule of a *Lysimachia*.

Not uncommon.

1865. June 6.	1869. May 11	1873. June 16.
1866. ———	1870. May 28.	1874. May 18.
1867. May 4.	1871. May 17.	1875. June 12.
1868. May 13.	1872. ———	1876. ———

3. Anagallis Linn.

1. A. arvensis Linn. *Scarlet Pimpernel.*

Bab. 285. Hook. 303. Benth. 306.

Cultivated fields. A. May to November.

Stems procumbent, from 6 inches to a foot long leaves opposite, sessile, ovate, entire, dotted beneath; flowers in pairs on pedicles longer than the leaves, and turning downwards after flowering; corolla scarlet, rarely pink.

Common but not abundant.

1865. June 20.	1869. by May 1.	1873. May 23.
1866. May 23.	1870. May 20.	1874. June 6.
1867. ———	1871. June 18.	1875. June 12.
1868. May 19.	1872. by June 15.	1876. June 18.

PLANTAGINACEÆ.

Herbs with a short woody rootstock, tufted leaves, and long leafless simple flower stalks, bearing a spike of flowers: sepals 4; corolla 4-lobed, dry and semi-transparent; stamens 4; on long filaments; capsule 2 seeded or several seeded.

The three species are easily distinguished.

Leaves broad, stalked, spike long ... ... 3. major.

Leaves broad, nearly sessile, spike short, stamens pink... ... ... 2. media.

Leaves narrow, spike short, stamens white ... 1. lanceolata.

P. lanceolate Linn. *Ribwort.*

Bab. 289. Hook. 258. Benth. 380.

Pastures and waste places. P. April to November.

Rootstock often branched, with tufts of woolly hairs among the leaves; leaves lanceolate, slightly hairy, erect, with 3 or 5 strong ribs running the whole length of the leaf; flower stalk furrowed, from 1 to 12 inches long, rising above the leaves; spike short, dense, with the long white or yellow stamens forming a circular fringe round it.

Very common.

1865. April 24.	1869. April 11.	1873. April 20.
1866. April 23.	1870. April 16.	1874. April 18.
1867. April 28.	1871. April 22.	1875. May 3.
1868. April 3.	1872. March 31, April 15.	1876. April 26.

2. P. media Linn. *Lamb's tongue.*

Bab. 289. Hook. 258. Benth. 380.

Meadows and pastures. P. May to October.

Rootstock branched; leaves sessile or very nearly so, in a rosette closely spreading on the ground, with 5 or 7 strong ribs, and more or less hoary;

Flower stalk 6 to 12 inches high, not channelled; head of flowers cylindrical, lengthening after flowering; and conspicuous when in flower from the numerous pink stamens spreading out all over it.

Very common.

1865. May 23.	1869. May 7.	1873. May 31.
1866. June 4.	1870. May 12.	1874. May 12.
1867. bud May 15.	1871. May 10.	1875. May 17.
1868. May 19.	1872. May 22.	1876. June 6.

3. P. major. *Way-bread.*

Bab. 289. Hook. 257. Benth 380.

Pastures, roadsides, and waste places. P. June to October.

Rootstock not creeping; leaves broadly ovate, erect, or spreading, with about 7 ribs, toothed, glabrous or slightly hairy; flower stalk not furrowed, 1 to 18 inches high, exceeding the leaves; spike very long; anthers purple.

Very common.

1865. by June 7.	1869. May 27.	1873. June 8.
1866. ———	1870. June 2.	1874. June 6.
1867. bud June 19.	1871. not by June 28.	1875. June 6.
1868. June 8.	1872. June 15.	1876. June 20.

NOTES TO PAGE 174.

* *i.e.*, the leaves in pairs and united by their bases, so that the stem appears to pass *through* the leaf.

† *A Cyme* is where the flower-stalk ends in a single flower; beneath this issue two branches, similarly terminated by single flowers, beneath which issue two other pairs of branches, and so on.

TWENTY-FOURTH HALF-YEARLY

REPORT

OF THE

MARLBOROUGH COLLEGE

Natural History Society,

(FOUNDED APRIL 9th, 1864,)

FOR THE

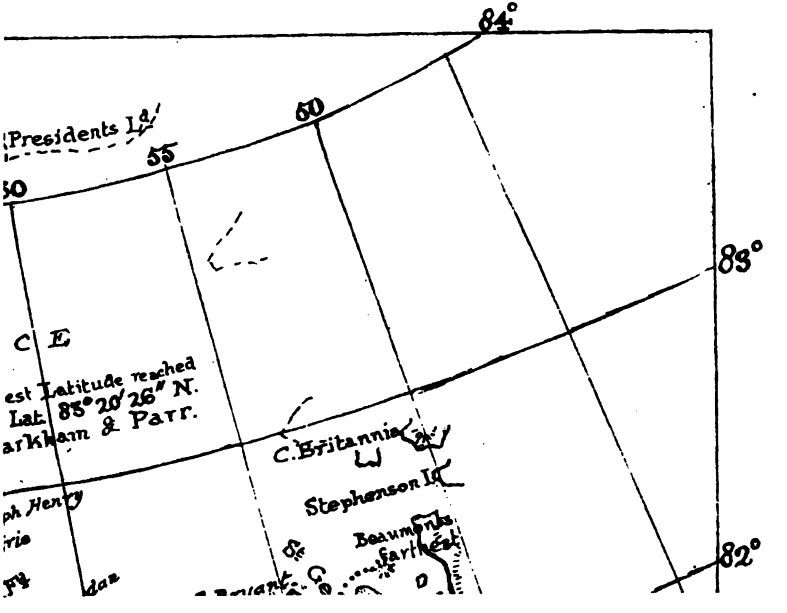
HALF-YEAR,

ENDING CHRISTMAS, 1876.

"Tum mihi Naturæ libeat perdiscere mores:
Quis Deus hanc mundi temperet arte domum."

MARLBOROUGH:
PRINTED BY PERKINS AND SON, "TIMES" OFFICE,
1877.

D.28.12.86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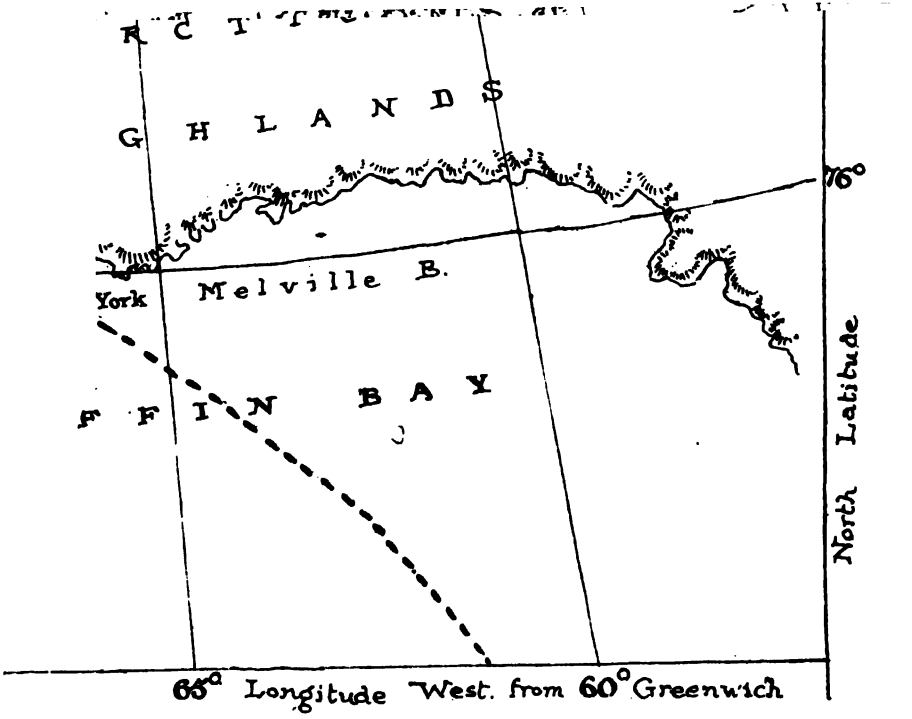
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76°
Melville B.
York
F F I N B A Y
North Latitude
65° Longitude West. from 60° Greenwich

TWENTY-FOURTH HALF-YEARLY

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1877

PREFACE.

From some cause or other the popularity of the Society among members of the School has diminished, which has been strikingly shown by the great decrease in the number of its Members. Including a few who have left the School, no less than 31 resigned Membership at the commencement of the Term; a few more were crossed off the List for various reasons, and these, balanced by 8 new Members, reduced the number of Members of the Society at the end of the Term to 23. There are very divided opinions as to the desirability of having a large number of Members, most of whom do not care in the least about the welfare of the Society, and whose only object in joining is to get as much pleasure and comfort as they can from the Field-days and Museum, or a small number who, if they do not actually work at Natural History, yet show in other ways their interest in it. Certainly the large number has caused much damage to the Museum, the repairs of which have amounted to more than the amount received from Subscriptions: fresh arrangements have been made, and the Committee are glad to report that the Museum is in a very satisfactory condition.

The only Collections which have at all increased are the Ornithological and the Library, the former by some specimens kindly supplied by H. Dumbleton, Esq., who has taken considerable interest in the matter, and the latter by several donations of Books and the completion up to date of the various Periodicals. One disadvantage of having a number of careless Members was the disappearance of various volumes, some of them unfortunately very costly: by placing all under lock and key, and by the appointment of an efficient Librarian, this difficulty has been overcome. The Committee go on the principle of supplying the more costly works at the expense of the Society, hoping that others will present those which are less costly, but which are very desirable for a Museum.

The attendance at the meetings has not been good, on one or two occasions excessively bad. It becomes a serious question whether it is fair to ask persons to read papers when attendance is so very uncertain. This has added considerably to the difficulty of providing a sufficient number of papers, and the best thanks of the Society are due to those who, notwithstanding this great source of discouragement, have endeavoured to make our meetings interesting.

The Funds of the Society are in a very satisfactory condition, mainly attributable, however, to the fact that from the want of interest in the Garden and Collections generally, the heavy expenses in connection with them have been avoided: whether this is any real *gain* is questionable. The sale of the last Report, though good, entailed a loss on the Society; the Committee hope to avoid such a misfortune in future.

Of the Papers printed in the Report, the first, by E. F. IM THURN, ESQ., was written in consequence of the paper on Darwinism in the last Report. The plate to illustrate this was drawn and lithographed by W. H. MACDONALD, ESQ., who has thus saved the Society considerable expense, and the Committee here beg to express their sincere thanks to him for his kindness. The second, by A. J. BURNESS, on the recent Arctic Expedition, will prove of general interest. The excellent map to illustrate this paper was kindly drawn by W. M. H. MILNER. The third, by MISS PRESTON, will also prove interesting. So little is known of Roumania, and so much has been talked about it lately, that on receiving some accounts of personal adventures in that country, MISS PRESTON kindly put them into a connected shape, with such other information as she has been able to gather. The usual Lists of Notices will be found in the Report, as well as full details of the weather of the past year; and finally, the concluding portion of the Flora of Marlborough: thus making up a Report which the Committee venture to hope will not be inferior to its predecessors, though larger than any hitherto published.

LIST OF MEMBERS.

President:
Rev. T. A. Preston.

Secretary:
W. M. H. Milner.

Librarian:
G. P. V. Hume.

Committee:

The Ex-officio Members.
G. F. Rodwell, Esq.
H. W. Thatcher.
A. J. Burness.

Honorary Members:

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W. E. Mullins, Esq.
Rev. J. Sowerby.
Rev. G. G. Bradley, D.D.
C. M. Bull, Esq.
W. Fergus, Esq., M.D.
S. B. Dixon, Esq., F.G.S.
W. H. Macdonald, Esq.
J. F. Duthie, Esq.
G. H. Dawson, Esq.
Rev. A. C. Almack.
E. F. im Thurn, Esq.
G. K. Mills, Esq.
W. Mansell, Esq.
Rev. G. W. DeLisle.
H. A. Evans, Esq.
Rev. J. W. Mills.
W. W. Fowler, Esq.
C. Sankey, Esq.
A. H. Beesly, Esq.
F. E. Hulme, Esq., F.L.S., F.S.A.
Rev. C. E. Thorpe.
Rev. J. S. Thomas.
Rev. F. W. Farrar, D.D., F.R.S.
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H. C. Spry, Esq.
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H. J. Verrall, Esq.
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H. P. Dixon, Esq.
W. A. Clarke, Esq.
Rev. W. M. Furneaux.
Rev. A. C. Smith.
J. B. Fuller, Esq.
A. E. Garrod, Esq.
T. O. Harding, Esq.
Rev. G. C. Bell.

Members:

H. W. Thatcher.
W. M. H. Milner.
C. E. Fox.
J. H. C. Dalton.
A. J. Burness.
G. P. V. Hume.
C. W. B. Jones.
G. M. Lawford.
G. R. Rogers.
M. Rogers.
T. A. Goddard.
E. G. Waddilove.
E. L. Brown.
W. H. M. D'Urban.
G. N. Going.
R. B. Dods.
C. S. Browning.
A. E. Aldworth.
C. B. Stewart.
A. C. D. Pigott.
H. Crookenden.
J. A. H. Cranfurd.
H. D. Rolleston.

EXTRACTS FROM THE RULES.

That this Society be called the Marlborough College Natural History Society.

Constitution.

That the Society consist of Members and Honorary Members.

Officers.

That the Officers of the Society consist of a President, Secretary, Treasurer, Librarian, and Curator.

Election of Officers.

That the President have the absolute power of nominating the Secretary.

That those Members of the Committee, who are not ex-officio Members, be elected terminally, and that the retiring Members, be eligible for re-election.

That the same rule apply to the Treasurer, Librarian, and Curator.

Management.

That the affairs of the Society be conducted by a Committee, consisting of the President, Secretary, Treasurer, and three other Members of the Society, to be elected from and by Members of the Society; three of whom shall form a quorum.

President.

That in case of an equality of votes, the President shall have a double or casting vote.

Secretary.

That the duties of the Secretary be to summon meetings (when necessary) of the Society; to keep a detailed report of the proceedings, as well as lists of Members and Visitors present at each meeting, and generally to act under the direction of the Committee in all matters connected with the welfare of the Society.

Librarian.

That the duties of the Librarian be to keep a Catalogue of the Library, with the names of the Donors, and to see that the Library Regulations are carried into effect.

Curator.

That the Curator be responsible for the order of the Museum.

Library.

That any Member of the Society be at liberty to consult any of the books belonging to the Society, but that only certain volumes, to be decided on by the Committee, be allowed to taken from the room.

That members of the Society be permitted to use the Museum at such hours as the Committee shall appoint; but that in the afternoon it be used exclusively for the purposes of Natural History.

Botanical Garden.

That the Garden be under complete control of the President, or of some person appointed by the President.

That the Garden be open to Members of the Society at all times, and that each Member be allowed to introduce one visitor.

Field Days.

That the Field Days be confined *entirely* to Members of the Society, and that the President appoint a day on which names must be given in.

Members.

That the election of new Members rest entirely with the Committee.

That every Member pay a terminal subscription of 2s., to be paid at the first meeting of the Society in that term.

That if a Member be elected after the commencement of the term, the amount of his subscription for that term shall be settled by the Committee.

That Members have the right to introduce two visitors at all general meetings of the Society; to have personal access to the Museum, and to introduce a visitor at such times, as shall seem fit to the Committee.

Honorary Members.

That Honorary Members have all the privileges of Members except the power of introducing a Member of the School to the meetings of the Society.

That Honorary Members pay 5s. a half-year, for which they shall be entitled to a copy of the Report.

That Honorary Members may compound for all future subscriptions by the payment of a sum of two guineas.

Suspension of Members.

That any Member be liable to be excluded from the Society by the Committee, if, in their opinion, he shall have failed to show sufficient energy in the working of the Society.

Sections.

That the Society consist of sections to be formed for the more accurate study of the different branches of Natural History, and that every Member must belong to a Section.

That the question of the number of Sections be left open for settlement at the beginning of each term.

New Rules.

That any Member of the Society have power to propose any new rule or any alteration in an old one, provided the motion be seconded by another Member.

MEETING HELD SEPTEMBER 20TH, 1876.

In accordance with a resolution passed at a Committee Meeting on the 19th, an appeal had been posted on the School Notice Board, asking the School to fill up the vacancies caused by the departure of Members from the School. The number of Members at the end of last Term was 49, but at the time of meeting only 17 appeared, subsequent enquiries confirming the impression then conveyed that all the others had retired from the Society.

At the present meeting—

W. M. H. Milner was nominated Secretary.

G. F. Rodwell, Esq.
A. J. Burness,
H. W. Thatcher,
} were elected on the Committee.

H. W. Thatcher was elected Librarian.

The General Meetings were fixed for Tuesdays, October 3rd, 17th, 31st; November 14th, 28th.

The Geological Section was to meet on every alternate Friday, beginning with September 22nd.

Notices of several books, some of them of value, being missing from the Library, were also announced. The "Zoologist" and "Land and Water" were to be continued.

MEETING HELD OCTOBER 3RD, 1876.

E. F. im Thurn, Esq., read a paper on Hæckelism, giving Hæckel's idea of the Evolution of Species; and then tracing the Life History of a Sponge to illustrate the theory.

Dr. Fergus spoke against the theory, but dwelling principally on the theological side of the question.

The President remarked that none of his objections to the theory had been answered, and pointed out in what way, in his opinion, the theory failed.

Mr. Hulme also alluded to the drawings of animals, on some of the most ancient monuments, from which we may conclude that no change had taken place in them.

The President exhibited a monstrosity of Potato, which had grown through a small hole in an Oyster shell, and swollen out on each side.

Also some Hercules Beetles (*Dynastes Hercules*) presented by W. G. M. D'Urban, Esq.

There were present 20 Members of the School; 3 Honorary Members; and 6 Visitors, including Mr. and Mrs. Bell.

HÆCKELISM.

Let me begin with a very simple but broad statement. All living things, plants and animals as well as those very simple organisms (*i.e.* Protista) which are hardly plant and hardly animal, are descended from a very few, or yet more probably, from a single ancestral form. This is the creed of Evolutionists as formulated by their chief English representative, Darwin.

This ancestral form, now extinct, was the simplest conceivable organism, and was akin, and similar to the simplest existing organism. This is the doctrine of the great German exponent of evolution, Ernst Hæckel, professor in the university of Jena. *

Darwinism and what we may call Hæckelism together give a very fair view of the whole theory of evolution. This theory was, as of course you know, not originated by either of these men. Darwin's great and honoured work was not the discovery that every existing animal and plant has originated from one or perhaps several common parent forms, for this had been done long before his time by Lamarck, by Goethe, and by many another great naturalist; but what he did was to discover the laws according to which these animals and plants have thus descended or deviated. These laws which he discovered and which are now known throughout the thinking world as the laws of natural selection, of the struggle for existence, of the survival of the fittest, and so on, he formulated and explained to the naturalists who already believed in the common descent of all living things. This body of written laws constitutes Darwinism.

As in England there is a great tendency among the non-scientific public to talk and think of these laws as though they constituted the whole of evolution, and as I know they have been discussed on more than one occasion in this room, it seems to me that it will be more useful, and certainly more novel, if, instead of repeating Darwin's wonderful story, I give you a sketch of the modern German contribution towards our knowledge of evolution, as represented by Hæckelism. The essential feature of Hæckel's work is that he has tried to construct the pedigree or family tree of the entire animal and

* It is only fair to point out that there is an Anti-Hæckelian School of Evolution in Germany.

vegetable kingdoms as one whole, and in such a way as to show the interrelations of all the various forms, as well as their common relation to their first parent.

This first parent must have been the simplest conceivable organism; not necessarily the simplest of the still living forms, but the simplest *conceivable* living form. To find this we must imagine it as something possessing only those parts and qualities which all living things have in common. That is to say it must have consisted of the substance called Protoplasm and must have been capable of taking in food, and of reproducing its kind. From something of this sort all other living things have originated.

It is necessary to recall to your attention the main classes of living things. They first of all fall into three kingdoms; that of Animals, that of Plants, and that of the Protista; the last kingdom containing certain organisms, of which the diatoms are the best known, and which are intermediate between animals and plants. Except that I shall presently shew you the points at which the first Plant and the first form of Protista branched off from the main stem, I shall say nothing to-night of these two kingdoms. Of the third, the Animal kingdom, you must bear in mind that it is distinguishable into several, now usually seven, groups, as they used to be called. That is to say that naturalists consider as a distinct group all those animals which most resemble each other and differ most from those included in other groups. But in modern times the evolutionist claims to have discovered that these points in which the members of a group resemble each other, and differ from the members of all other groups, are due to the fact that the original ancestor of that group varied off from the main stock and transmitted the rudiments of future differences to all its descendants. All the members of a so-called "group" are therefore blood-relations, and are in no way connected with any other animals except through that original ancestor. In order to express this blood-relationship Haeckel drops the term "group" and substitutes "tribe," or "phylum." The seven tribes are these:—

A. Primitive Animals (Protozoa) ...	Rhizopods. Infusorians.
B. Zoophytes	Sponges. Corals. Comb Jellies. Hood Jellies.
C. Worms	Ring worms. Round worms. Planarians, &c.
D. Star-fish	Sea stars. Sea-lilies. Sea-urchins. Sea-cucumbers.

E. Arthropods	Flies. Myriapods. Spiders. Crustaceans.
F. Molluscs	Slugs. Snails. Mussels, &c.
G. Vertebrates	Mammals. Birds. Amphibious Animals. Fishes.

Now the least developed of the tribe of primitive animals are not only the simplest existing animal forms, but answer to our definition of the simplest conceivable living form; we must therefore not only place them at the foot of the tree of living things, but must also consider them to resemble the parent form from which all that now lives has sprung. Let me describe one of these to you; it is a Moneron, (fig. A), and the whole body consists of an exceedingly minute lump of slime or protoplasm. The whole substance is of one sort and one density; it is entirely shapeless, and is able to extend any part of the surface of its body into an irregularly shaped process. This it does when it comes in contact with any small particles capable of serving it as food; when this happens the whole body of the Moneron, grows as it were, round its food. Again when its body has attained a certain size, it falls into two parts, (fig. a. 1 & 2), each of which is a perfect Moneron. Here then we have a living thing consisting merely of pure undifferentiated protoplasm, and with only two vital powers, that of absorbing food, and that of reproducing its kind. In other words, it was from a thing of this sort that all other living organisms have developed.

With this Moneron let us compare any one of the cells of which all living things are built up, much in the same way that a brick wall is built up of bricks. These cells are small lumps of slime or protoplasm, and would appear originally to have had no kernel: this circumstance we infer from these two facts; in the first place each living thing is in the beginning of its life *one* single cell, and this cell has as far as we can see with our present microscopes no kernel; secondly, we have great reason to suppose that the original form of cell was in all ways identical with the simplest form of living thing. However this may be, the cell soon acquires a kernel, and it is by the mere increase in the number of such cells that what we call growth in any living body takes place. Now the first form of cell, the lump of protoplasm *without* a kernel, is in all ways similar to the first form of life; and similarly the second form of cell, the cell *with* a kernel, is in all ways similar to the second form of life. I say, in all ways similar, because not only is each one of the cells, which in greater or smaller numbers constitute every living body,

similar to the whole body of these lower animals in form and substance, but it is also so in qualities; that is to say that each cell of your body, or that of any other animal or vegetable, is capable of absorbing food and of reproducing itself by division, in the same way as we saw the Moneron perform these acts; and, in the case of those cells which are sufficiently free from the pressure of other cells, is even, like the Moneron capable of protruding the surface of its body wall in any direction. From all this we find that the lowest living things consist of a single cell, while all those of a higher grade consist of a number of similar cells. I shall not delay as long over the later stages of animal development.

Carry your minds back through the ages, not such ages as are reckoned by thousands of years, but by vast and indefinite periods, each of which lasted for millions, perhaps for million of millions of years; through time so vast that it is inconceivable to the human mind, which passes back through it much as a child might walk along the road wondering as to the size of the universe. In those earliest times, when as yet there was no life on the earth, the first Moneron came into existence. Presently this divided, and then each of the two thus produced again divided, and so on in infinite series until before long the whole Laurentian world was peopled by these primæval animals.

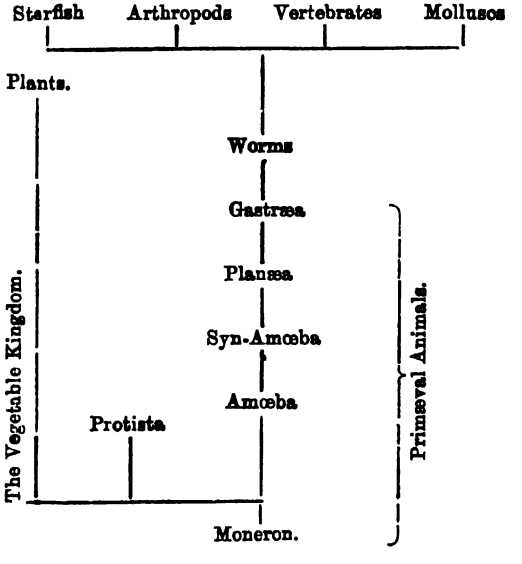
But before this the laws of variation had come into play. A single Moneron found itself surrounded by circumstances which were entirely new to its kind. For instance, it, probably, accidentally absorbed some new food-matter, which acted chemically on the central portion of its own substance, hardening it into a kernel. We know as a fact that such chance variations may be inherited by the descendants of those forms which first varied, and we are therefore justified in assuming that this Moneron became the ancestor of a family of new animal forms, differing from the old, only in the fact that each of the new had a kernel or nucleus in the centre of its body. This is no hypothetical form that I am describing, for enormous numbers of similar animals exist at the present day, under the name of Amœbæ (fig. B). This primæval Amœba was therefore the second ancestral form of the Animal kingdom. But before this stage was reached other Monera had varied from the ancestral form in a slighter degree than did the ancestor of the Amœba. They varied, that is to say into the countless organic forms which are neither animal nor vegetable, but all of which are summed up in the kingdom of Protista. About this stage also the Vegetable kingdom branched off from the animal line in this way; while the kernel of the Primæval Amœba was being formed, for of course this was only accomplished by a gradual process extending through many generations, some Moneron which had already acquired the rudiments of a kernel, was placed in circumstances which caused the outer surface of its body to harden. This variation it transmitted to its descendants, which

therefore differed from all other Monera and Amœbæ in that their bodies were covered by a hard membrane. It thus became the parent of all plants.

We have now put the first strokes to our sketch of the great family tree. The Moneron is at the bottom. Immediately from this root, the Protista must be represented as a growth of offshoots, which have never developed far. From out of this low growth two main stems spring up into the air; one of these is that of the kingdom of Plants, with which we now have nothing more to do, while the other represents the Animal line.

TABLE I.

Showing the relation of all living things to their common ancestor, the moneron.



The second stage in this animal line we have already found in the Amœba, which is not only identical in form and in qualities with the cells which build up every animal body, but exists up to the present day, and may be found among the duck-weed in almost every pond. On the other hand, the next three stages no longer exist as distinct animal forms; while, owing to the fact that their bodies consisted entirely of soft slimy protoplasm, they have left no fossil traces. It is as well here to call attention to the obvious fact that it is

only those animals which have hard parts in their bodies, or which secrete hard shell-like structures that can occur as fossils.

Yet notwithstanding these facts we may see the primæval animals which I am now describing any day, as I will presently show you. The first of these three stages, that is the third in the animal line, developed directly out of the Amœba in this way. A single Amœba divided itself (fig. *Z*) into two animals or cells in the usual way, but these two instead of separating, as had been usual, and leading independent lives, stuck together. Again when these became four cells, all four remained attached. This process was continued until in place of a number of separate cells each living as a distinct animal, there was a solid ball, formed by an accumulatio nof cells, each of which exactly resembled an Amœba. This animal may be called a compound Amœba, or as Hæckel calls it, a Syn-amœba (fig. *C*.) In appearance it so closely resembled a mulberry, the cells corresponding with the little globules (drupes) of the fruit, that it has been called the "Morula."

We now come to the fourth stage, in which, unlike the last, all the cells are not of one kind. Each of the cells on the surface of the body, became prolonged outwards into a hair (cilium). This was effected in this way; the simple Amœbæ, both the primæval and the existing forms, crept about, but were incapable of moving freely in the water. The compound Amœba moved about more freely; but presently an individual arose in which the cells on the surface stood out unusually prominently; we know that these cells have the power of moving any part of their surface, but since they began to live in a compound state, it was naturally only their outer surface that were free. These outer extremities were then the only part that they could move. The motions of these against the resisting water now moved the whole body, and in this way a much freer mode of locomotion was acquired and proved highly advantageous. This power was naturally inherited by the descendents of the original individual, and was increased in each succeeding generation, until at last the prominent surfaces of the outer cells become lengthened into hairs, by means of which the whole animal swam freely about, instead of creeping, as did its ancestors. The fourth animal stage, called the Planæa, (fig. *D*) was thus completed. It had a round solid body, consisting of cells of two kinds; those in the centre of the body being still exactly similar to the original Amœba cells, while those on the outer surface were produced into long hair-like processes, by means of the vibratory movements of which the whole animal swam freely about.

The fifth stage is most important; it is called the Gastræa (γαστηρ), (figs. *E* & *EE*) because it is the first animal which is not solid, but has a stomach cavity. You will best learn its form by hearing how it originated from the Planæa. From the centre of the solid body of the latter some of the cells in some way

disappeared; Haeckel in one place suggests that they perhaps dissolved into a liquid state by the process called "fatty degeneration," and that the liquid thus produced was consumed as food by the cells of the body wall. This of course caused a cavity in the centre of the body, while presently some of the cells of the body wall gave way.

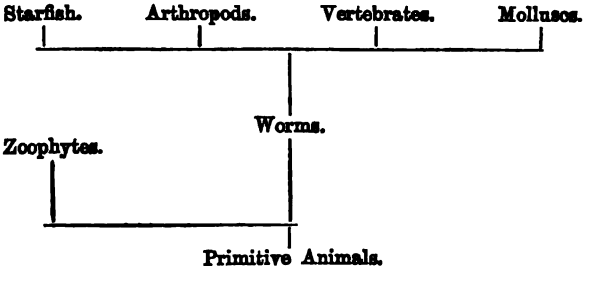
The animal now had a mouth as well as a stomach, and swam about the ocean in the form of a hairy cup.*

Haeckel ascribes so much importance to this Gastræa, that he has called his whole scheme the Gastræa Theory.

This animal is the last of the tribe of primitive animals, and consequently the highest of that tribe on the stem of the family tree. From this point a side shoot represents the Zoophytes,

TABLE II.

Family Tree of the Seven Tribes of the Animal Kingdom, according to the gastræa theory.



while the main stem passes upward to the worms. Four different forms of worms represent the first parents of the four higher tribes of animals. At the point where the Worms are on the family tree, the stem therefore branches out in four directions, representing respectively the tribes of Mulluscs, Starfish, Arthropods, and Vertebrates. In other words these four tribes are in no way related to each other except through their common Worm parent.

Time forbids that I should do more than sketch the simplest, that is the lowest, branch of the family tree, which must serve as a sample of the others.

The Zoophytes, which form this first branch, include those of the animals which build up the various kinds of coral, the sea-anemones, jelly-fish, and many

* It must be remembered that the words "stomach" and "mouth," as here used, only mean a cavity in the centre of the body, and an opening from that cavity to the outer air.

other kindred forms. But Hæckel, apparently, on very good grounds, makes a very important addition to these in the sponges. I propose to finish off my subject by telling you the life history of a sponge, by which we shall gain three points.

In the first place we shall justify this placing of the sponges among the Zoophytes; secondly, we shall see how a large series of apparently very different animal forms all develop from a common parent form: thirdly, and especially, I shall fulfil my promise of showing you how we know that the primæval Planæa and Gastræa, though they are now extinct, and have left no fossil traces, once existed.

Perhaps the most striking fact which we see in watching the life history, that is the evolution of any *individual* higher animal, is that it, as an individual, passes through a series of forms, identical with the series of forms through which its tribe has passed. For example, this sponge (fig. *G*) which I now put before you has actually passed through a series of forms, each of which corresponds with a stage in the evolution of the whole group of sponges. Every one knows that the butterfly passes through various stages before it becomes a butterfly. It comes into existence as a tiny egg; so tiny that we cannot see the various wonderful changes which occur in it before it becomes a caterpillar; this in its turn changes into the chrysalis; and lastly, the chrysalis becomes the butterfly. But every one does not know that every higher animal passes through a series of stages as diverse as those of the butterfly.

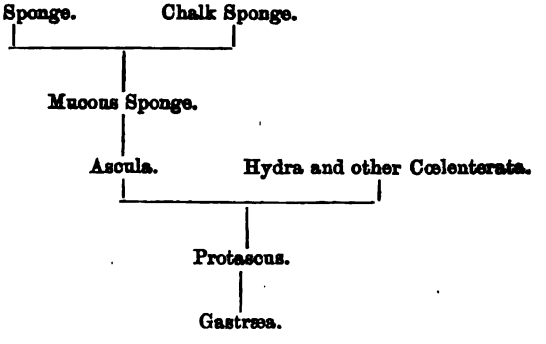
If you look at this sponge (fig. *G*) you see that it is a cup-like body, adhering to the ground by its closed end, and that the walls are much perforated.

This very sponge which you see before you was once a formless undifferentiated mass of protoplasm (fig A) exactly similar to the primæval Moneron. A little later and a kernel (nucleus) was formed in this protoplasm (fig B), so that the embryo sponge was in this stage a true egg cell, resembling the primæval Amœba. Next this egg cell separated into two cells (fig Z), then into four, into eight, and so on. It thus assumed a form corresponding entirely with the primæval Compound Amœba (fig C). The young sponge now assumes another larval form; instead of remaining a round ball of cells, all of which are of one kind, the outer cells become ciliated. This larval form is called the Planula (fig D), and corresponds to the Planæa of the Laurentian ocean. Just as this latter developed into a Gastræa, so does the Planula of the young sponge develop into a corresponding larval form, called the Gastrula, (fig E and EE.)

This is the point at which the sponge with the rest of the Zoophytes branch off from the main stem of the animal kingdom

TABLE III.

Family Tree of the Zoophytes, and of the Sponges in particular.



The Gastrula is therefore the last stage common to the young sponge and to the higher animals. The Gastrula of the sponge sinks to the bottom of the sea and becomes fixed, (fig F and FF.) Its cilia being no longer required for locomotion disappear. In this stage it exactly resembles the primæval animal (Ascula) which was the common ancestral form of sponges and of the other Zoophytes. It developed a series of tentacles round the mouth of the cup; this was all that was necessary to produce the structure common to the whole coral and sea anemone group. A little later these developed a number of small sacs, containing an irritating nettle-like fluid which they have the power of discharging against their enemies. Many of you, while bathing, may have found yourselves regarded as enemies by jelly fish, and been stung.

But others, instead of developing tentacles and stinging sacs, became the ancestors of the three main classes of sponges. The fixed cup-like Ascula first became a true sponge, when its body wall became porous (fig G.) These earliest forms, called mucous spunges, consisted entirely of the soft animal cells. But by and by they began to secrete matter, sometimes flinty, and sometimes chalky, from the surrounding water. This matter they built up into a delicate framework (fig G) or skeleton, supporting the whole body. According as they secrete flinty or chalky matter they are called flint or chalk sponges. Of the former you have an example in your common bath spunge; that is to say you use the flinty and elastic fibrous framework of the spunge, from which the true spunge, the animal protoplasm has been removed. Some of these flint spunges weave their fibres into the most intricate and lovely patterns. The most beautiful of all these is the Venus' flower basket. (*E. Speciosa*). The chalk spunges again are equally varied in apparent external form, but have essentially the same structure as all the other spunges. Now Hæckel has watched and

minutely measured an extraordinary number of the larval states of the most different of these spunges, and has found that the series is in all cases the same; that, namely, which I have described to you. Briefly then, each spunge, each zoophyte, each animal begins life as a simple cell (fig B); then this changes into a mass of similar cells (fig C); in a later stage this mass becomes hollow (fig E and EE.) In the case of each spunge and each zoophyte as well as in that of some higher animal, the individual passes through each one of the ancestral stages in their original sequence. In the case of other higher animals, each individual repeats a certain number of the ancestral forms, other links have dropped out of the chain, but those forms which it does repeat are always repeated in their original sequence. It must be added that the first three stages are invariably repeated by all animals. If you take an instance from among the higher vertebrates, for instance a bird, you may easily watch the egg through the first three stages, and, with a little more patience, through the later stages.

It is hardly possible to over-estimate the importance of the evidence in favour of the "Theory of Evolution," borne by this repetition of ancestral forms by the individual. In the first place it enables us to see more links in the long chain of animal forms, which have disappeared from among living animals, and, on account of the soft nature of their bodies, have left no fossil traces. In the second place, it seems to me, that it most completely answers the cry most frequently raised by those opponents af the theory of evolution who have not studied the evidence in its favour, that is to say by the greater number of its opponents. This cry of theirs is, that it is utterly impossible to *conceive* the evolution of a highly complex animal or plant from a simple cell. Our answer to this is that it is not only quite possible to *conceive* it, but that it is even quite easy to *see* it. You need not carry your thoughts back through limitless time, you need not search the whole crust of the earth for the missing links of the chain; for you may see the whole process occurring under your very eyes.

Such is a little of the evidence, not supplied by Darwin, in favour of what is usually loosely called "Darwinism," that is to say the Theory of Evolution. I shall have succeeded in my purpose if I have attracted the attention of any of you to the fact, that, tremendous as is the weight of Darwin's own evidence in favour of evolution, there are yet other enormous masses of evidence which are being brought to back the young theory of evolution in its struggle with the old Teleological doctrine: in this one case, may the young completely demolish the old.

EXPLANATION OF PLATE.

The Plate represents the first 5 primæval stages of Animal Life:—

A. *1st stage*: Moneron, life history of
- a. 1. an individual Moneron
- a. 2. the same in process of division
- a. 3. the two Monera resulting from this division.

B. *2nd stage*: Amœba, life history of
- b. 1. an individual Amœba
- b. 2. the same in process of division
- b. 3. the two Amœbœ resulting from this division
- b. 4. an Amœba in a state of rest.

C. *3rd stage*: Compound Amœba or Synamœba.

D. *4th stage*: Planæa, in section; showing the central cells (which retain their original form) and the outer cells (which become ciliated).

E. *5th stage*: Gastræa, E E, same in section.

The Plate also represents the life history of an individual Sponge. The 1st stage was originally, probably as in fig. A.

2nd stage: fig. X, and fig. Z which represents X after its first process of division.

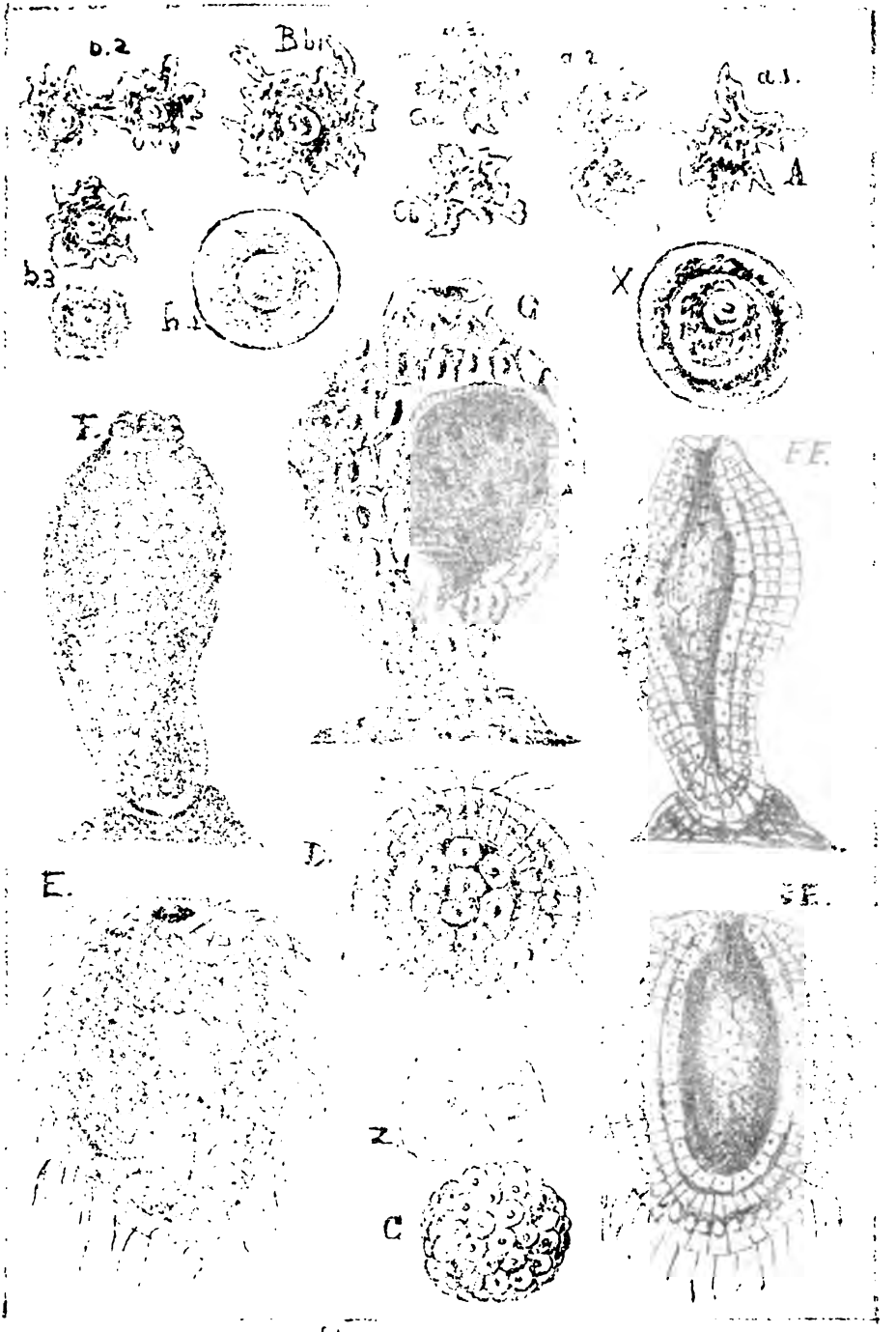
3rd stage: fig. C, the Morula, answering to the Compound Amœba.

4th stage: fig. D, the Planula, answering to the Planæa.

5th stage: fig. E, the Gastrula, answering to the Gastræa.

6th stage: fig. F, the Ascula, and fig. F F, the same in section.

7th stage: fig. G, a single adult sponge person, showing the pores in the body wall, and the flinty spicules. A portion of the body wall has been removed to show the central body cavity.



after HAECKEL.

NOTE TO PAPER ON "HÆCKELISM."

Though the foregoing paper was not written as any answer to my objections, but rather in order to put before Members a more detailed explanation of the Theory of Evolution, it may still be considered as intended in some way to be an answer to them. But I do not think that any one of my "Objections" *have* been answered.

My objection as to the whole series of Evolution depending on *chance* is more than fully sustained. Hæckel not only denies that there is any guiding Providence, but alludes to the subject in a manner most offensive to those who believe in it.

It will be observed in the paper that every change is attributed to *accidental* circumstances, (1) accident by which something causes a hardening of a part of the body to form what has been happily termed a *kernel*, the essentially important part of the animal; (2) *monstrosity*, by which the cilia are formed, but why they should in their early stages, as described in the paper, be for the "advantage" of the animal, I do not see: till they are of a sufficient size I should consider them very disadvantageous. It is curious, too, how such a beautifully regular system of Cilia (not scattered indiscriminately, but arranged for rendering special service to the animal) should be thus formed by purely accidental means; (3) *disease*, by which a very important cavity is formed. It is very true that in its earlier stages, digestion may go on equally well, whether the animal be turned inside or out, as in the case of the *Hydra*, but when this is taken in connection with the arrangement of the cilia, it seems most marvellous that all these beautiful adaptations should go on, subordinated to one another, and all be the result of mere accident or chance of the very lowest type.

One word more. These various stages of development primarily took "millions of millions" of years to be brought about, the missing links are filled up by an examination of what takes place in the development of an embryo—these latter changes are accomplished in a few days or even hours. What peculiar "accident" has happened by which these changes are accomplished in so short a time now? Perhaps it is an "inherited power." If so, whence did that Power come?"—T. A. Preston.

MEETING HELD OCTOBER 17TH, 1876.

F. E. HULME, ESQ., delivered a most interesting lecture on "Gothic Architecture," illustrating his remarks by drawings on a black board. Commencing from the earliest times, he traced it up to the "Early English Period," when, time proving insufficient, he was obliged to postpone any further remarks to a future opportunity.

The President exhibited various specimens to show the nature and structure of bone and of the union of broken bones.

The meeting was miserably attended. There were present 6 members, the Secretary, 2 hon. members, and 2 visitors.

The meeting for October 31st was deferred in consequence of the excessive want of interest shown by the bad attendance at the last two meetings.

At a private meeting held Nov. 8th, C. V. Hume undertook the duties of Librarian, as H. W. Thatcher found it impossible to be as much in the Museum as was desirable. Other arrangements were made for the greater order and comfort of the Museum.

MEETING HELD NOVEMBER 8TH, 1876.

D. E. OLIVIER read a paper on the Solar System, which was followed by a discussion in which but a few members took part.

There were 30 persons present, 14 members, 1 hon. member, and 15 visitors.

MEETING HELD NOVEMBER 28TH, 1876.

A. J. BURNESS read the following paper on the late Arctic Expedition.

There were 14 members, 1 hon. member, and 17 visitors present.

THE LATE EXPEDITION AND ITS RESULTS.

ON March 23rd, Mr. Beesly read a paper on the object of the Expedition, which was just going to leave England. That Expedition left our shores, and has now returned; I therefore intend to-night to put before you as well as I can, the voyage and an outline of the results obtained. No doubt you have all read an account of it in the papers, and have also seen the illustrations

shewing positions of the ships at different times, and representing the difficulties of sledge travelling. But I think I am safe in saying that very few of you have a clear idea of the incidents of the voyage from Disco to Cape Union and back. I propose then to describe this voyage, according to all the accounts which have been issued up to the present time.

The Expedition left Portsmouth May 29th, accompanied by the Valorous, and after making a very stormy passage across the Atlantic, arrived at Disco Island, where a good supply of coal was taken in from the Valorous. The Alert also took on board thirty dogs and a driver. The two ships left Disco at one o'clock in the evening of July 16th, taking the inspector of North Greenland on board the Alert. The Discovery was in tow of the Alert, and his boat in tow of the Discovery. The next morning they arrived at Rietenbank, a small island thirty miles north, between Disco Island and the main land. Here the Discovery shipped thirty dogs. A hunting party was sent out, which succeeded in obtaining a considerable quantity of birds: another party paid a hasty visit to a neighbouring glacier.

The daylight now lasted during the whole twenty-four hours. The Valorous left at four on the next day, and proceeded to the coal seams to take in coal, to make up for that which had been transferred to the Alert and Discovery. At seven p m. on July 17th, both ships sailed out of the Waigat Strait, and signalled their last farewell to the Valorous. At Proven, a small settlement a few miles further up the coast, the Eskimo dog-driver, Hans Petersen was taken on board. This man had accompanied the Expeditions of Kane, Hayes, and Hall, and was very highly spoken of by Dr. Kane.

After leaving Upernivick, the two ships steamed northward between the mainland and the islands to Kanjitok Island (*It is high*). Here they were enveloped in a thick fog, and difficulties of navigation presented themselves, on account of the sunken reefs, which barred the narrow channels. These reefs were not marked in the chart, and accordingly an Eskimo was engaged, who professed to know the coast. On the 23rd of July, under the guidance of two Eskimo, who had been taken on board, they proceeded cautiously amongst the numerous islets, which studded the coast. The fog was very thick, and the soundings gave no bottom with 100 fathoms of line. Suddenly, however, the Alert grounded, and it became apparent that the Eskimo had overlooked the fact the two ships drew more water than their Kyacks. As the tide went down the Alert with the Discovery in tow was left resting on the bank, but on the return of the tide, the ship was got off without any damage being received. The fog having lifted, the Expedition quickly passed the Brown Islands, through an open sea. Captain Nares was of opinion that the calm weather was likely to continue, and therefore determined to cross Melville Bay instead of making the usual detour round the coast.

The use of steam vessels was most apparent. Both vessels at full speed, charged through the floes, consisting of very rotten ice, and of about 250 yards in diameter. After running 60 miles, the sea became more and more open, and by 9.30 of the 25th of July they sighted the high lands of Cape York, and by 11 o'clock were fairly in the North Water, having traversed the Middle Pack in the unprecedented time of 3 hours. Soon after sighting land, the "Discovery" parted company to communicate with the natives at Cape York, while the "Alert" proceeded towards the Carey Islands.

A vast collection of icebergs had accumulated at New York, being brought up by the East Greenland Ice Current, which rounds Cape Farewell, and advances up the West Greenland coast, to Melville Bay. More westward, out to sea, these were less numerous, which Captain Nares attributes to the current coming down Smith's Sound and forming the Labrador Current, sweeping them away.

After communicating with the natives at Cape York the "Discovery" made for the Carey Islands, where she was rejoined by the Alert.—July 26th. A large depot of 3600 rations was deposited, and a cairn erected, containing a record of the Expedition so far. Passing between Hakluyt and Northumberland Islands, the Expedition anchored near Port Foulke at 8 a.m., July the 28th Lyttleton Island and Lifeboat Cove, the scene of the wreck of the Polaris, were visited, but scanty remains were found in the cache, the only valuable objects being a few boxes containing among oth-r things the log or a copy of it. On Lyttleton Island a cairn containing a record was erected. The sportsmen who went in search of game on the high grounds of the mainland, reported an ice-blink to the north: by an ice-blink is meant, a yellow appearance in the sky due to the reflection of the light from the ice; so that reporting an ice-blink meant to say there must be an extensive field of ice towards the north, and this was the first indication they received of their coming difficulties. Port Foulke is considered by Captain Nares to be better adapted for an arctic wintering place than any other bay along either the east or the west coast. A warm current aided by northerly winds keeps the ice constantly broken in winter, and promotes an early spring and an excellent seal and walrus fishery. The sea thus freed from its icy covering warms the air in winter, and promotes vegetation, which at this part of the coast is very abundant. The sea abounds in seals and walrus: thus an excellent supply of fresh meat is secured, a fact which plays a most important part in all expeditions. On July the 29th, both ships sailed across the straits to Cape Isabella, and erected a cairn, in spite of a thick snow storm. On the following day after working their way slowly through the pack, past Baird Inlet and Leconte I., both ships were secured in a small harbour which was named after Lieut. Sabine. A depot was deposited on one

of the islets most suitable for sledge travelling, and a cairn containing a record on the highest islet. The nature of the pack had changed to much older ice, made up of heavy floes of from 10 to 12 feet, and very much decayed and honeycombed. The ships were detained three days in Payer Harbour, being unable to pass Cape Sabine, on account of the pack: so many times did they attempt to get out of this harbour and have to return, that the sailors gave it the name of "Bide-a-wee Harbour." After numerous fruitless attempts to escape from their temporary prison, they at last managed to round Cape Sabine, and made all sail along the southern shore of Hayes Sound for a distance of 20 miles, securing the ships in a snug harbour, the shores of which abounded in game. Two glaciers, which united at the head of this bay suggested the name of Twin Glacier Valley. On August the 5th the ships made sail across the channel to Cape Albert, a headland of the most southern of what have hitherto been supposed to be islands, but which have been shewn by Captain Nares to be connected. An attempt was next made to take advantage of an opening in the ice to round Victoria Head, but before midnight they were hopelessly beset, and the floe to which they were attached was drifting rapidly towards an iceberg. Preparations were made for receiving a severe nip, and rudders and screws were unshipped in anticipation of the approaching danger. The "Discovery" was relieved from her dangerous position by the floe wheeling round, and changing its line of advance in the direction of the "Alert." Fortunately the iceberg, when only 100 yards off, by turning round became a defensive buffer instead of a threatening foe, and the ship escaped with a slight nip, and was secured in the back-water formed behind the berg. Both vessels were employed for the next 24 hours in pressing through the ice, with full steam up and dodging through the narrow lanes of water, at the risk of nips and the loss of their boats. The "Discovery" on this occasion displayed her superior qualities to the "Alert" in forcing a way through the ice. Having less beam and a finer bow she was enabled to charge the ice at full speed, and break through, and then back for a second blow, and so on till a way was cleared.

On the 8th of August at 8 a.m. they had reached the land water off Cape Victoria "having sustained no more serious damage, during this severe trial than sprung rudder heads, consequent on going full speed a-stern." Several inaccuries in the Chart are here pointed out by Captain Nares.

It is not quite certain whether Hayes Sound is a channel connecting some seas with Smith's Sound or not, or whether it is merely a deep inlet. The absence of bergs and heavy ice high up the sound might suggest that it is closed; but the configuration of the land, added to the fact that the ebb tide coming from the east is much stronger than the flood coming from the west, and also the abundance of Eskimo remains, which usually line the

shores of channels, seems to point it out as a channel. After rounding Cape Victoria, the ships were secured to the floe in Princess Marie opening, and at high water then proceeded to Franklin Pierce Bay. On the following morning, after erecting a cairn containing a record, close to Cape Harrison, they attempted to round Cape Prescot. Close to Norman Lockyer Island, is Walrus Shoal, so called from the numerous ancient remains of Eskimo, who had subsisted on Walrus, the bones of which animal lay scattered about. The Slow Tidal motion in Franklin Pierce Bay denotes that the Bay lies out of the general run of the tide, and perhaps will prove to be only a deep inlet. As August is proverbially a quiet Month in the Arctic Regions, and the western mountains prevent winds blowing off the shore, the ice sticks closely to the shore, and advance is by no means rapid. The pack in the offing contained some very old hummocky ice.

They were detained a fortnight in this neighbourhood, and during this period a constant watch was kept on the ice; yet though several openings shewed on ahead, Captain Nares felt convinced that if he ventured into the pack, he would very soon be carried away southward. In Walrus Shoal itself, they were detained 3 days. On August the 12th, the ebb tide cleared off the ice from the shore, during a calm, and enabled them to round Cape Hawkes; but the flood tide coming up, brought back with it the ice and so they were hemmed in once more. On August 13, after blasting the ice, they managed to secure a dock for the ships. Continued blasting effectually cleared a way, and no further check was experienced until abreast of Cape Frazer. The character of the pack had now changed from detached pieces of 6 to 8 feet in thickness, to old hummocky ice from 12 to 20 feet; its peculiar blue colour denoting great age. Through this barrier the ships bored with full steam up, rounded Cape Frazer, and on August 19 were fairly in Kennedy Channel. Off Cape Collinson, both ships took refuge behind shelter from the ice, in a backwater formed behind a huge ice-berg, which, projecting far into the sea, directed all the ice down the Channel, and left a clear safe harbour behind it. Here the current rushed along with considerable velocity.

A clear voyage was made across Kennedy Channel up to Cape Morton, where they were once more stopped by the ice, and had to seek safety in Bessel's Bay. While detained there, Captain Nares ascended Cape Morton, which is about 2000 feet above the level of the sea. From this elevated position, he saw right along north, as far as Cape Union. Up to Lady Franklin Sound the west coast appeared clear of ice, while on the east coast the ice seemed very heavy opposite Polaris Bay. Hastily getting under weigh, the expedition recrossed Kennedy Channel, and entered Lady Franklin Sound. On August 26th a small harbour was discovered on the north side of the Sound, to which the name of "Discovery Harbour" was given. Vegetation

was fairly abundant here, and game as well, 9 musk oxen being shot soon after their arrival. It was in this bay, that Captain Nares determined to leave the "Discovery." Its position was Lat. 81 deg. 44m. N., and long. 65 deg. 3m. W. On August 26th, the two ships parted company, the "Alert" taking with her a sledge party belonging to the "Discovery," commanded by Lieutenant Wyatt Rawson. Scarcely had the "Alert" got outside Lady Franklin Sound, than she was stopped by the ice; and after vainly endeavouring to bore through it, was compelled to return to Discovery Harbour. Two days after, the ice cleared away from the shore, and the "Alert" was just preparing to start when a thick fog came on, and put an end to all operations for the time being. When the fog lifted, it was low tide, and the ship was discovered to be in a small basin with mud sides, from which it was impossible to escape till high tide. After extricating themselves from this helpless position, they made a clear sail up to Cape Beechey, a distance of 15 miles, where they were unfortunate enough to get their rudder injured. Fortunately a spare one was on deck. At this point in the voyage an unexpected relief appeared, in the shape of three musk oxen, which the hunters succeeded in shooting. Next day they advanced to Lincoln Bay, and had a most exciting race to escape a nip from an iceberg. The ice by this time had become highly dangerous and of an extraordinary character. The very heavy ice on shore forced the vessel out into the pack, and she was now in a position of the extremest peril: surrounded on every side by a mass of pack ice, consisting of very ancient floes of about 80 feet in thickness, and extending from 1 to 4 miles. As the huge hummocks ground past they lifted up the ship's boats, but luckily did not damage them seriously.

There was now no doubt, that they were approaching a region of ice, which resembled and was perhaps connected with the ice on the west of Bank's Land. Just a word about that ice. On August 15th, 1850, the Investigator, Captain Mc.Clintock, ran from the mouth of the Mackenzie, into what appeared open water. After sailing about 90 miles, the alarming discovery was made, that they had run up an inlet in a vast sea of ice, which now stopped all advance. Hastily returning, they managed to avoid the closing in of the ice. In August, 1851, the Investigator again examined this ice. It was about 80 feet thick. The surface resembled rolling hills, some of them 100 feet from base to summit. Captain Collinson of the Enterprise, in 1850, in attempting to sledge on it, had his sledges broken, and one of the crew broke his thigh. Drift wood which must have come from the mouths of Siberian rivers, is found on the West Coast of Banks Land, and on Prince Patrick Isle; a circumstance shewing that this sea of ancient ice is subject to movements which are at present unexplained. Its extent is almost beyond comprehension. It is bounded on the south by the shores of N. America; on the east by Bank's

Land and Prince Patrick Isle; and on the west by Kellett Land, while to north it stretches an unknown distance. But this area has proved to be only a corner of an ocean, which in its frozen state would appear to cover the North Polar Region. The distance from Kellett Land to Beaumont's furthest being about 1140 miles. We left the "Alert" caught in the pack, by Lincoln Bay. On September 1st, after having struggled out of the pack, they ran up Kennedy Channel, before a stiff gale at 9½ knots an hour, with an open water ahead. At noon, on reaching lat 82 deg. 24m., the ensign was hoisted in honour of having attained the hightest north latitude ever reached by a ship. In Robeson Channel they found the cliffs very steep, and consequently the ice grinds close up against them, instead of stranding in the shallow water. But after rounding Cape Union, the shore became low, and the land trended away to the west. The ice grounds in about 100 feet of water, forming an inner harbour or basin, fringed by a wall of ice 60 feet high. A sad disappointment awaited them here. The land represented by Hall to have been seen to the north, was no longer visible, and the gigantic masses of ancient floe ice only proved too clearly that they were on the shores of a frozen ocean. Still hope was held out that the thick fog which hung over the ice might be obscuring the reported land. A severe gale looked as if it promised to drive the ice off the shore. But on the contrary, the great fields remained almost motionless, and there was no doubt that the ice had closed up for the winter, and would not move again till next summer. The pack ice extended close up to Cape Sheridan, and during a furious gale, which raged during the night, the ice stuck to the shore with unusual pertinacity, and little hope was held out of being able to round Cape Sheridan. On the morrow, September 2nd, the wind changed from S.W. to N.E., and the ice was rapidly driven in towards the shore. A most exciting scene ensued. The "Alert" was outside her dock, waiting to take advantage of any opening in the ice. By means of hawsers and other appliances the crew contrived to haul the vessel stern first into the dock; but not a moment too soon. The pack now acted as a protection instead, its great solidity and size forcing fresh pieces of ice on shore, and thus relieving the vessel of many unpleasant neighbours. An extraordinary phenomenon was witnessed at this time, which indicated the vast power of the ice. At times, a huge floe drifting past, caught on the bottom, and the end furthest away from the shore, got broken off from the parent mass, and swung round in shore. The main piece now relieved of a great part of its weight, also swung round, but came into contact with the piece broken off; this it slowly and majestically forced on shore, pushing up a mass of many thousands of tons, as if it had been a mere piece of cork.

On September 5th, Commander Markham and Lieutenant Aldrich were despatched to explore a harbour eight miles off, and see if it would be a suitable wintering place. On September 11th, the fog having cleared up, they were unable to discover any signs of land to the north. Three days afterwards the ice shifted from the shore, but owing to the fact that they were unable to fix the screw, and also that a blinding snow storm came on, they could not take advantage of the opportunity to proceed further along the coast. The following day, September 16th, the ice closed up for the winter, and with the exception of tidal cracks, there was no movement till the following July.

The harbour in which they were now enclosed, proved to be the best that they were likely to secure along the Coast. On September 25, the sledge parties began the Autumn travelling, and proceeded to lay a series of depôts in the line which the Spring sledges were to follow. On Oct. 2, Lieut. Rawson, who, you will remember, had been taken away from the "Discovery," left the "Alert," with his sledge party, to attempt communication with their companions in Lady Franklin Bay. On the 14th they returned, having met unsafe ice nine miles from the ship. They found the travelling very much impeded by the accumulated snow drift. This was the second time he had attempted to communicate with the "Discovery." The first time he was only absent two days.

On the fifth of October, Lieutenant Aldrich arrived, after an absence of thirteen days, having, with the aid of Adam Ayles, attained a lat. of 82 deg. 48 m., the same as that which Parry attained in boats, north of Spitzbergen in 1827. He also observed land, extending 60 miles to the N. West, to lat. 83 deg. 7 m., with high mountains towards the interior. The difficulties attending the sledge parties were very great, with the thermometer standing at 60 to 70 degrees below freezing point, sledges had to be dragged over weak ice and soft snow, occasionally traversing hills of snow and ice to avoid the open pools of water, which occurred through tidal cracks. In the Northern division, out of a party of twenty one men and three officers, seven men and one officer were frost bitten. These frost bites were caused thus. The weight of the snow on the new ice, bears it down, and causes the water to ooze through, and the slush thus formed, constitutes a sort of blanket to the ground below. When the men walked through this, their feet got soaked, but the slush felt warmer than it really was, because it was so much warmer than the air in which the men were; and consequently they got frost-bitten some time before they were aware of it. The tents got so saturated with moisture that, when they came back they weighed double as much as when they started. On four occasions the sledges broke through the ice. Heavy snow fell on twelve consecutive days, so that men had to wade up to their middles. The wind acting on the snow produced a phenomenon, commonly seen in

Siberia, and which proved very troublesome in place of advantageous to the sledge parties. After the wind had been blowing for some time in one direction, it raised up the snow in long parallel ridges, like waves to which the hunters of Siberia apply the name of "Sastrugi." These "Sastrugi" are used by the Siberians for tracking their way in winter over the snowy wastes of the "Tundra." But in this case, the sledges had to encounter them at right angles, instead of travelling along the tops of them, consequently they presented formidable perpendicular surfaces, which had to be scaled at the expense of time and labour.

Preparations were now made for the winter. The engine room was covered with a thick layer of snow, which effectually kept out the cold, temperature remaining at 28° Fahr. during the winter. On Oct. 12th the sun left them not to return for a period of 142 days. Two days afterwards Commander Markham returned with his northern sledge party, having succeeded in placing a depôt in lat. 82 deg. 44m., and also in tracing the coast line nearly two miles further, thus reaching the exact latitude attained by Sir Edward Parry in his famous boat expedition in 1827. The winter was passed most cheerfully by all on board. Theatricals and lectures were employed to keep up the men's spirits. Their chief employments consisted in building up the snow embankment, which was thrown down every spring tide, and in taking exercise on the measured mile. The last pool of water was seen on November 16th, after which date the ice remained compact, except when broken by tidal cracks. The winds blew steadily and gently from the eastward, and the quiet state of the atmosphere was productive of the greatest cold ever experienced in the Arctic regions. The minimum temperature registered was—73°7 Fah., and for 24 hours,—70°31 Fah. For 13 days the mean was—58°9 Fah., and for 5 days 9 hours,—66°29 Fah. In February the mercury remained frozen for 17 consecutive days, then a warm S.W. wind raised the temperature; after which the mercury remained frozen for 15 more days. During the autumn the snow fall was very considerable, but in the winter it was conspicuous by its absence; and indeed, the crew experienced great difficulty to bank the ship. Contrary to expectation the aurora was very seldom seen, and even then was by no means brilliant. What flashes were seen appeared in the zenith, but could not be traced to any magnetic or electrical disturbance.

The game list of the "Alert" during winter quarters comprised—

Winter quarters	Musk Oxen	Hares	Geese	King Ducks	Eider Ducks	Long-tailed Ducks	Ptarmigan	Walrus	Seals	Foxes
By sledging or...	6	7	67	12	...	9	...	...	1	3
Service parties...	...	13	3	5	...	...	10	...	...	...
Total	6	20	70	17	...	9	10	...	1	3

On March 1st the sun returned, and it was not till then that they realised how great the darkness had been. On March 12th Lieutenants Rawson and Egerton, accompanied by Petersen, set out to communicate with the "Discovery." Petersen, however, broke down, and the officers and sledge party returned to the ship. Petersen never recovered, but died from exhaustion on May 14th. On March 20th, with the thermometer at 62° below freezing point, another attempt was made, and after six days' hard toil, they succeeded in reaching the "Discovery." On April 3rd the sledge parties got ready to start. Commander Markham and Lieutenant Parr led the northern division, and were accompanied as far as Cape Joseph Henry by the western division under Lieutenant Pelham Aldrich and Lieutenant George A. Gifford. The next day the sledges under Lieutenant Rawson returned from the 'Discovery.' They brought the cheering news that their companions in "Discovery Harbour" had passed a pleasant winter, and had obtained an excellent supply of fresh meat. On April 8th, the first supporting sledge returned from the northern and western division, having endured great cold, but were gradually getting accustomed to it. On April 10th Lieutenant Rawson and Sub-Lieut. George Egerton set off with light sledges to pioneer for the Eastern division. On April 14th the second division of auxiliary sledges arrived, and reported that the main party were getting on very well, with the exception of one marine, who was brought back, suffering from debility. The temperature had risen to —26° and several slight frost-bites had occurred. The appearance of the ice 6 miles from land was not encouraging. Captain Nares here states that the crews of the sledges preferred tea to rum, and even to such an extent that they willingly put up with the necessity of having to stand about in the extreme cold while the water was being boiled. Two days afterwards, the sledge under Lieutenant Beaumont and Dr. Coppinger arrived from the "Discovery;" the ice being so rough that they took 10 days to travel 76 miles. They had found the depôt in Polaris Bay fit for use. Accordingly the eastern division was manned. But first Lieutenant Rawson and Mr. Egerton made a preliminary journey across Robeson Channel, and examined the Greenland coast by Repulse harbour, which proved to be much smaller than usually represented. On April 20th the eastern division under Lieutenant Beaumont, accompanied by Lieutenant Rawson and Dr. Coppinger, started for Greenland, the crews being composed of men from the "Discovery" who had not had so much experience in sledge travelling, owing to the fact that the ice remained in motion until very late in the season. Three days afterwards Captain Stephenson and Mr. Thomas Mitchell arrived from the "Discovery" to take measures about the expedition, and the examination of Peterman's Fiord and Bessel's Bay. A week later Captain Stephenson returned.

On May 3rd, Lieutenant Gifford returned with good news about the western division, but reported that they were experiencing difficulty in traversing the soft snow. The same day Dr. Thomas Colan reported the outbreak of scurvy, and from this date the disease advanced considerably for some time, and weakened the sledging a great deal. This severe sickness, which so often attacks Arctic travellers had been amply provided against, and notwithstanding all these precautions, it gave a very severe check to all the expeditions, which it attacked. The men were so enfeebled, that they were obliged to be placed on the sledges, and thus were a loss to the strength of the sledge crew, and a heavy addition to the burden they had to drag. On May 9th, Lieutenant May and Mr. Egerton brought back news of the Greenland division; when they left, Lieutenant Beaumont had advanced to within two miles of Cape Stanton. The Coast on the east of Kennedy Channel (Mainland of Greenland) resembled that on the west, being exceedingly rugged and precipitous; the cliffs rose abruptly from the sea, and presented a rocky barrier against the pack, which constantly drove up against it, and formed a most chaotic mass of floe bergs, heaped one upon the other. Travelling was therefore very tedious: a week was passed in traversing 20 miles. Under such circumstances a depôt was left, as a guard against any unforeseen motion of the ice, which might render the road impassable. The 24th of May welcomed back the last of the depôt relays under Lieutenant Giffard, though he had experienced great difficulty in dealing with two of his crew who were attacked with scurvy. A week later Mr. Crawford Conybeare arrived with news from the "Discovery" up to the 22nd of May. He reported that Lieutenant Archer had proved "Lady Franklin Sound" to terminate in a glacier. After accomplishing this Archer dispatched Lieutenant Fulford and two boats to the assistance of Lieutenant Beaumont, and on June 12th this party was overtaken by Captain Stephenson and Mr. Hart, naturalist, at Polaris Bay. On the following day, they visited Captain Hall's Tomb, and put up a brass tablet, placed upon a new foot-board, in place of the old one. Dr. Coppinger paid a visit to Polaris Cairn and Boat Depôt, and removed all serviceable and valuable articles to the "Discovery." He then proceeded with Lieutenant Fulford to explore Petermann Fiord. On June 8th Lieutenant Parr arrived with the news that the Northern party had broken down from scurvy, and were now at Cape Joseph Henry. To bring this news, Lieutenant Parr had walked 30 miles by himself, in 24 hours, an extraordinary feat considering the ground travelled over. Immediate assistance was rendered, which arrived too late to save the life of one of the men named George Porter. When another start was effected, the party attained the unparalleled north latitude of 83 deg. 20 m. 26 s., and in longitude 86 deg. 30 m. W., when the state of the ice obliged them to return. The travelling was fearfully severe. After leaving the land at

Cape Joseph Henry, the route seldom lay over smooth ice, the surfaces of the floes were thickly studded with rounded blue-topped ice hummocks, of a mean height above the surface level of 10 to 20 feet; lying sometimes in ranges, but more frequently separated at distances of 100 to 200 yards, the depressions being filled up with snow, deeply scored with "Sastrugi." Separating these ridges like a broadened-out hedge, lay a vast collection of the débris of last Summer's broken up pack ice, which had been re-frozen during the winter into one chaotic mass of angular blocks of various heights up to 40 and 50 feet. The "Sastrugi," which usually facilitate travelling, because the sledges glide so smoothly along the tops of them, were now encountered at right angles, and formed difficult barriers, instead of affording any assistance. A passage had always to be cut with pickaxes through the squeezed up ice, and inclines hewn out of the perpendicular walls of the floes, so that nearly all the day was spent in drawing up the sledges a few yards. Under these circumstances, the distance attained was truly wonderful. Although the Northerly division practically only got 73 miles from the ship, 276 miles on the outward, and 245 miles on the homeward journey had to be traversed to attain that distance. The maximum rate of advance per day was 2¼ miles, and the minimum 1¼.

The Western division under Lieutenant Aldrich was absent 83 days, during which time the coast was tracked as far as 85 deg. W. Long. This long absence excited the suspicions of Captain Nares, who began to think that the scurvy had attacked this party, in the same manner as it had attacked the others. Accordingly a relief sledge under Lieutenant May was despatched, and fell in with the party at the depôt, 30 miles N.W. of the ship. The aid rendered was only too much needed. Out of a crew of seven, Lieutenant Aldrich and Adam Ayles were the only ones remaining at the drag ropes. The Expedition had explored the coast for 220 miles from the 'Alert.' "After passing Cape Columbia, the extreme northern point, in Lat. 83 deg. 7m. N. and Long. 70 deg. 30m. W., the coast extends to the west for about 60 miles, to Long. 70 deg. W. and then gradually trends round southward, to Lat. 82 deg. 16m. N. and Long. 85 deg. 33m. W., the extreme position attained." No land was seen to the north or west, nor was the appearance of the ice conducive to the probability of there being any. Part of the details of the east and Greenland division has already been related up to May 5th. After that date Lieutenant Beaumont with two sledge crews proceeded to the north-east along the coast of Greenland. Shortly afterwards one of the crew, James Hand, showed symptoms of scurvy, accordingly Lieutenant Rawson, with three men and the invalid, were despatched to Polaris Bay, while the rest continued their journey. During this return two more men broke down, and thus all the work at the drag ropes devolved on Lieutenant Rawson and one seaman. On June 3rd

the depôt was reached, and then Hand succumbed to fatigue. Four days afterwards, Lieutenant Fulford and Dr. Coppinger with Hans arrived at Polaris Bay, and succeeded in saving the other two sick men. Lieutenant Beaumont with his remaining men pursued his journey, and on May 21st reached Lat. 82 deg. 18m. N. and Long. 50 deg. 40m. W., and also discovered land extending to Lat. 82 deg. 54m. N., Long. 48 deg. 33m. W. On their return journey, they too were attacked by scurvy, and only three were able to work, the remaining being advanced two at a time. This delay prevented them from arriving at Polaris Bay on the proper day, so Lieutenant Rawson and Dr. Coppinger, with Hans and his dog sledge, started to meet them on June 22nd, and met them in Newman's Bay, 20 miles from the depôt. In spite of this reinforcement, one more man gave in, and eventually they reached the depôt after great hardships. Shortly after their arrival Charles Paul died in sight of the "Alert," to which he belonged. The ice in the straits prevented their crossing, and a month was spent in shooting game for the sufferers, and providing fresh meat for themselves. On July 12th Lieutenant Fulford, with two men and the dog sledge, set off for Discovery Harbour in order to procure help, which was immediately despatched. The party were conveyed across the straits in relays, the more serious cases waiting to recruit their strength. The whole party had crossed on August 14th, after having been absent from the ship 120 days. During their exploration of Petermann Fiord Lieutenant Fulford and Dr. Coppinger proved that it terminated in a glacier.

From these expeditions Captain Nares was of opinion that "owing to the absence of land trending to the north, and the Polar Pack not being navigable, no ship could be carried north on either side of Smith's Sound beyond the position already attained. And also that from any attainable position in Smith's Sound it was impossible to advance nearer the pole by sledges."

No regular thaw had occurred till July 1st, but after that date it was very rapid both on shore and land; still there was no actual movement in the ice for three weeks. On the 23rd the pack was driven off the shore by a strong S.W. wind, but no navigable channel was formed round Cape Sheridan. Three days subsequent, a cairn containing a record of the expedition was left. On the 31st they cleared away the ice barriers in front of the dock, and rounded Cape Rawson. At Cape Union they were stopped by a heavy floe, after a run of ten miles. Charging the ice was out of the question, so the only thing to be done was to wait until it shifted. Their huge neighbour was a constant source of alarm. Such was the size and weight of this Polar ice, that when the heavy floe met the floe-bergs, which had grounded off the coast, and exerted pressure upon them, it tilted them up, and drove them in all directions as though they were made of cork; effecting this result without any damage to itself. Early on August 1st, the heavy floe which had

stopped them the day before, began to move at the rate of 1½ miles per hour, and scraped along the ice foot towards the ships, in a most alarming manner. Steam being fortunately ready, they cast off, and succeeded in passing between the floe and the shore, after going through the narrowest possible escape of total destruction. Considerable trouble was experienced in rounding Cape Union, and the constant movements of the ice required the most vigilant attention and careful direction of the ship. Capain Nares was not a bit the less equal to the occasion, and by means of the prompt manner in which he took advantage of the channels afforded by the movements of the ice, the ship was safely steered up to Cape Beechey, where they were once more checked, and had to go through the same manœuvres with the ice. As the pack was very firm, the sportsmen took advantage of the delay to visit some lakes, where musk-oxen had been shot the summer before. In place of getting any oxen, they succeeded in shooting fifty-seven geese, which formed a very welcome addition to the empty larder. Mr. Egerton and one seaman were despatched, during the delay, to communicate with the "Discovery," which was only twenty miles off. They started on August 5th, and arrived the same evening, and had a rough journey. The next day there was a considerable disturbance in the ice which protected the ship, as the drifting pack in the stream in Kennedy Channel, drove up against it with terrific force, and upset the floe-bergs to a large extent. The same evening Lieutenant Rawson arrived from the "Discovery" with news about the Greenland division. During the night of the 7th a heavy gale drove the pack close up to the ship, and she underwent a pretty severe nip, which raised her three feet out of the water. The pack looked so settled, that all hands set to work to "out out" the ship, and on August 11th, after three days' work, they succeeeded, through the drifting of the pack, in releasing the ship, and reaching "Discovery Harbour." After spending a short time there in transferring the sick men to the "Discovery" and waiting for Lieutenant Beaumont, both ships rounded Cape Lieber, and were forced in shore by ice at Radmore Harbour, near Cape Lawrence. Here, as the tide went down, the "Alert" grounded, against a small floe, being fixed forward, but with deep water under stern. With the return of the tide, the ship was got off without injury. A S.W. wind opened the pack and enabled them to advance to Cape Collinson. On August 22nd, off that Cape, the "Alert" was obliged to back very suddenly, and consequently came into collision with the "Discovery," which resulted in the loss of a davit to the latter. This was the only time the two ships came into collision, although they often were very close. They experienced great difficulty in rounding Capes Frazer and Hayes, and secured the ships near Cape Napoleon. Captain Nares corroborates the statement that the flood tides from the Polar and Atlantic Seas meet at Cape Frazer, but he adds that the

exact point varies one or two miles, according to the prevailing wind. The 29th saw them in Dobbin Bay, out of range of the pack and the ice-bergs coming from the north. On September 1st, Dobbin Bay was crossed, and two days afterwards they reached Cape Hawkes, after expending a large quantity of coal in driving through the ice. A whole week now elapsed before they reached Norman Lockyer Island. As their chance of getting away that winter was closing in, Captain Nares walked to the summit of the island with Captain Stephenson, and descried open water some twenty miles south, with insignificant ice intervening between it and the ship. Instantly setting out, they strained every effort to pierce the ice, but their stock of coal was not very large, and they required all the steam they could get up. But on the morning of the 10th they rounded Cape Victoria. The last barrier they encountered, was broken through by being simultaneously charged by both ships, which then made all sail down Smith's Sound. The remainder of the voyage is so very unimportant and uninteresting, and so well known to all who read the papers, that I have not thought worth while noticing it, except the fact that they missed the letters deposited for them by the Pandora, on Lyttleton Island.

The difficulty experienced by this expedition in navigating Smith's Sound, Kennedy and Robeson Channels, appears gigantic when compared with Hall's triumphant sail up these straits, which was accomplished without a check; but it must be remembered that Hall's case was very exceptional, and the merest chance in the world; and it must also be borne in mind that Hall left the North Water at the most opportune time in the season.

In the late Expedition, sail was only used once during the outward voyage, and then only for a distance of 20 miles, whilst it was not used at all during the homeward voyage, clearly displaying the absolute necessity of having steam vessels to navigate ice seas.

No detailed account of the scientific results have as yet been issued, and therefore I cannot do more than just run over them.

First the Geological. Drift-wood, which was found at an altitude of 150 feet, showed the land had been raised, and the rounded rocks at that elevation, also bore testimony to the abrading power of the ice grinding against it. A most important discovery was made that Miocene Beds existed there, clearly proving, that at no very remote period, there existed there a temperature, considerably warmer than what is now found. The discovery of coal beds higher than ever before known, corroborated the evidence of the carboniferous system at the Rietenbank. Deep sea soundings have produced specimens of the kind of bottom in Kennedy and other Channels. The Physical Geography has been noticed in the Eastern and Western sledge divisions. It may be added

that all the Coast line on both sides of Smith's Sound etc., has been explored from north to South, with the exception of Hayes' Sound.

With regard to the Meteorological Surveys, Captain Nares says that 'the salt-water ice formed during the winter attained its maximum thickness of 75½ inches early in June. In a fresh-water lake at the same date the ice was 79½ inches thick, with 12 feet of water at a temperature of 32° Fah. below it. This proves decidedly that the deep lakes do not freeze to the bottom in winter. The lowest temperature registered by a thermometer buried two feet in the ground beyond the influence of any sudden variation was 13° below zero, 59° warmer than the air at the time. The sun's rays were most powerful on June 13th and 21st, when a thermometer, with blackened bulb in vacuo, registered 128° and 129°, the temperature of the earth's surface at the time being + 27° and of the air + 34°."

"At Floeberg Beach, the time of high water, full and change 10 h. 44 m.; spring rise 3 ft., neap rise, 1 ft. 7¾ in., neap range 5 in." With regard to zoology, etc., it may be said that nearly all animal life stops at Cape Frazer, as far as Sea is concerned, and there is no clearer proof of the absence of land to the north. During the Expedition, the usual Arctic animals, such as the bear, walrus, lemming, etc., were observed, but not nearly in such numbers as at Melville Island.

Just a word about the Greenlanders or Innuit as they call themselves. It is clear that they cannot have come from the east, as there are no traces of them on Spitzbergen, Iceland, or Ian Magen Island. It is to Siberia that we look for the origin of these people, for the Greenlanders most resemble the Iakhuts.

During the centuries preceding the first reported appearance of the Skroellings in Greenland, there had been a great stir in Central Asia. The Mongols and Tartars began to send forth great hordes to all parts of Asia. The result was that their influence was felt even in the north of Siberia, where several nomadic and defenceless tribes gained their living by their fishing or hunting. It was on these that the storm fell. The invading Tartars expelled them, and caused them to go further north to seek fresh hunting grounds.

The Iakhuts, it is said, were not the first inhabitants of the country along the banks of the river Kolyma. The Omoki, a tribe of fishermen, and the Chelaki, the Junguses and Iukahirs preceeded them. The Omoki are said to have once been exceedingly numerous all along the northern coast. Another tribe, the Onkilon, who were fishermen in the Gulf of Anadyr, have disappeared, but no one knows where they went to. They took a northerly direction over the ice and, it was believed, went over the land which is visible on a clear day from Cape Jakan. The Omoki

are said to have departed in two great bands, and to have gone north with their reindeer, probably over the same ground as the Onkilon. Their *yourts* of earth and stone and fox traps are to be seen on Melville Isle and on a good many of the Parry Isles. These *yourts* correspond with those found by Wrangell at the mouth of the Indigirka.

The land seen from Cape Jakan, was reported to Wrangell. It was afterwards identified by Captain Kellett who sailed in the Herald up Behring's Straits, and discovered Kellett Land and Herald Isle.

Theories have been advanced that there must be land somewhere between Kellett Land and Cape Union, because the ice west of Banks' Land, in fact all the frozen sea enclosed between Kellett Land and Banks' and Prince Patrick Isle is unable to move up north, owing to some barrier. The late expedition has shown that the land trends away to the west, but how far, we are at present unable to state. Still, the ice encountered by the "Alert" seems to show that the whole Polar Sea is frozen, and that such a large mass of ice cannot be moved much by the tide or wind.

It will be noticed that I have adhered to the proceedings of the "Alert," and discarded those of the "Discovery." I have done so, because I have not been able to procure Captain Stephenson's report, and thus give the details; but I have given the broad outline of the Western sledge party under the command of Lieutenant Beaumont, as well as the explorations of Lady Franklin and Petermann Sounds.

STRAY NOTES FROM ROUMANIA.

THE Danubian Provinces, although they have occupied, and still retain a prominent position among the political problems of the day, are but little known as regards their resources, wealth, inhabitants, and capabilities of development. This is chiefly owing to the difficulties of travelling in a country where railways, until within the last few years, were almost unknown, and where the roads are mere tracks across the country, becoming in rainy weather quagmires of mud, and in dry seasons nothing better than long dust heaps, which obscure the view, and almost choke the traveller.

Bounded on the north by the Carpathian Mountains which separate them from Transylvania, and on the south by Turkey, these Principalities occupy an important Geographical position, lying as they do on the direct road from Vienna and Central Europe, to the Black Sea, and they command moreover an extensive stretch of the Danube. The inhabitants have had many Masters, and are still under the nominal protection of the Turkish empire, with a sort of friendly supervision of Prussia through their present Hospodar, Prince Charles 1st, of Hohenzollern-Sigmaringen, who was elected in 1866. Previous to the amalgamation of Wallachia and Moldavia, the government of these provinces was vested in Hospodars appointed by the Sultan, and their history during that period is one uninterrupted sequence of intrigue and lawlessness. The constant efforts of Russia to obtain a footing in the country tended greatly to the bad government which prevailed, as the Czar neglected no opportunity to create discontent and stimulate intrigue, in the hopes he might acquire the protectorate, and eventually the possession of the Provinces. His efforts were sufficiently successful to render the allegiance of the Provinces to the Porte very doubtful, and had the result of the Crimean War been otherwise than it was, the Cossacks would probably at the present day be watching the frontier of the Russian Empire on the banks of the Danube.

The question of the Danubian Principalities was settled at the Paris Conference, 1858, by the Sultan relinquishing all direct authority over the Provinces, retaining only the tribute that was then, and is still, paid by them to the Porte. In 1859 Wallachia and Moldavia were united under the name of Roumania, with a constitutional government presided over by a Hospodar elected by the people, instead of by the Sultan as formerly. Their choice fell

on Alexander Couza, who was proclaimed at Bucharest and Jassy, in Dec., 1861: but a revolution breaking out in 1866, Prince Couza had to resign, and the Crown was then offered to the Count de Flandres, who however refused it. The next choice of a sovereign fell on Prince Charles of Hohenzollern at that time an Officer in the Prussian Army, who was proclaimed Hospodar, and enthusiastically received at Bucharest in May of the same year. The Roumanians are a restless and uncertain people, very impetuous and excitable, with but little education, and, above all, fond of change, hence it is not surprising that their Government is a matter of some difficulty, and that their Ruler finds his task a hard one. The origin of the inhabitants has given rise to much discussion, but the Roumanians pride themselves on being the direct descendants of a colony of Romans, sent by Trajan into Dacia, and they insist on being called Roumans, a title which according to some, may one day be transformed into Romans. Indelible traces of the residence of the Romans in these Provinces are still to be found in the remains of ancient buildings, buried ornaments, cairns, and old mineral workings, and their language is undoubtedly Latin, though corrupted and intermixed with strange words of Dacian and Servian origin. The upper classes speak French much more than German, and in Bucharest the French language and Parisian fashions are patronised by all the wealthy.

Bucharest, the capital and seat of the Roumanian Government, as well as the residence of a Greek Archbishop, is situated in a rich and spacious plain on the banks of the Dumbovitza a tributary of the Argish, about 40 miles north-west from its junction with the Danube. It is a widely scattered town about 7 miles in circumference, with tolerably broad, dusty, streets running at all possible angles, and contains about 200,000 inhabitants. Independently of its agreeable situation, Bucharest has no claim to its designation, which means "City of enjoyment:" it possesses but one fine quarter, where the Palace, most of the Public Buildings, and all the best Shops are situated, but this small nucleus of civilization and refinement is surrounded by a wide margin of utter barbarism, the streets in parts become almost impassable from extreme dirt, and everything betokens the greatest neglect and ignorance The Russians however did much for the Town, and made many improvements during the year they occupied it: the Chaussée made by them is now used as an evening Promenade, and in fine weather is much frequented by the inhabitants.

The prevailing religion of Roumania is that of the Greek Church, though both Lutherans and Roman Catholics enjoy free toleration; there are also a good number of Jews and Armenians, but the former have been most cruelly treated and made to endure the greatest hardships. Churches are numerous in Bucharest, there must be at least a hundred; the façades are generally

highly decorated, but the roofs are low and always made of tin, surmounted by domes, of which no church has more than three. The people, who are highly superstitious, flock to these buildings to receive the benediction of the Popa or Priest, and to burn lamps before the numerous images of saints which decorate the walls, but their worship is one more of form than of prayer. Once a year a great fair is held at Bucharest which lasts a week. Crowds come from all parts to attend it, and strangers have thus a rare opportunity of studying the various nationalities, and the peculiar costumes of the peasants who delight in anything bright or gaudy. When in gala costume the Wallachian wears over his white cotton blouse and trowsers, a prettily embroidered sleeveless jacket, white lamb-skin cap, something like a large fez, and sandals. The dress of the women resembles that of the men, in addition to which they wear a sort of coloured petticoat, and occasionally a kind of bodice made of silver tissue; most of them have gold coins round their necks. Their hair is worn in long tresses, and ornamented with flowers or coins, strung on a thread and curiously interwoven in the hair; young girls never wear any covering on the head, but married women use a white scarf with coloured ends folded gracefully after the manner of a turban. As a rule the men are very handsome, with fine, intelligent faces, and erect and manly in appearance, but the women do not always contrast favourably with the men; they are generally small, and their features worn and coarse through exposure and toil, for at a very early age they are put to out-door work, and their beauty becomes marred by the effect of hard labour. Exceptions to this rule are occasionally met with, where the peasants are wealthy and civilised enough not to send their daughters to the fields, and they are then found to possess great natural beauty; the bulk of the population, however, are but patient drudges labouring in the fields of the "boyards" or gentry of the country. Last year (1876) the fair was held the first week in June and though there must have been thousands of people crowded together, they were very quiet and well behaved. In the various stalls were displayed everything you can imagine, from wooden moveable houses to pots and pans, all supposed to be the work of the natives themselves. On the chief day of the fair the Prince, with his wife, the Princess Elizabeth, of Nieuwied, to whom he was married in 1869, were present; they were expected at four o'clock, and the soldiers had hard work to keep the road clear, for as time wore on and they did not arrive, the people tired with waiting, amused themselves running backwards and forwards across the road, to the great disgust of the police, who tried in vain to catch the culprits as they disappeared in the dense crowd. "We were stationed in a capital position, and were highly amused with all that was passing around us, the only inconvenience being that the people would push close to the carriage and the smell of garlic was

at times almost overpowering. It was seven o'clock before the Royal Party arrived; the Prince was on horseback, and the Princess with her mother in an open carriage, the former in native costume, as were also some of her ladies in waiting. The Princess has a sweeet face, and looked very pretty as she bowed gracefully to the people, but there was not the faintest attempt at cheering, though both Prince and Princess appear to be much liked, especially the latter. As soon as they left we determined to go home as it was getting late, and many of the natives also started on their return journey in bullock carts, carrying their purchases with them, in the shape of houses, wooden milk cans, pans, gravestones, &c., so that we found it a difficult matter to thread our way through the crowd; however, after nearly knocking down some half-dozen people, and narrowly escaping smashing into one of the bullock carts, we safely reached our destination."

The climate of Roumania is much colder in winter than might be expected in a latitude corresponding with the north of Italy: the rivers are generally frozen over, and the ground covered with snow for a considerable time, but the summer and early autumn months are very hot, and all who can do so gladly leave the towns for some cooler residence. Sinaia is the favourite place of resort, it is most pleasantly situated in the mountains about 86 miles from Bucharest, but only 8 miles from Praedal, the frontier town of Roumania and which consists of but a few huts and a Douâne. There is about a Kilometre of neutral ground between this place and the Austrian frontier, on arriving at which a great change is noticeable in the appearance and disposition of the people, who are much cleaner and neater, and not so officious. To reach Sinaia from Bucharest you must travel by rail to Ploesti, 35 miles, and thence by diligence across a level plain for about 50 miles—Ploesti, like all Roumanian towns, is very much scattered, and far from clean, the Royal Family always avoid passing through it if possible, as the inhabitants are anything but loyal subjects. At Sinaia are several small villas for the nobles, and likewise a large Hotel with most prepossessing exterior, but with little else to recommend it, the interior arrangements being excessively dirty and uninviting. A Palace is being built here for the Prince and Princess, but in the meantime they are obliged to reside in a neighbouring Monastery. the walls of the royal apartments are only whitewashed, but the Princess, who is very talented, has embellished them herself with most clever caricatures drawn in chalk, of some of the nobles.

The scenery about Sinaia is very fine and grand, and hearing there was a most pleasant excursion to the old Monastery of Pesthera, situated some little distance off in the mountains we started one fine morning in September, a party of three ladies and six gentleman, an interpreter, and a servant with provisions bringing up the rear: the ladies were riding, but the gentlemen on

foot. None of our party had ever been to the Monastery, nor did we know the exact road; however, passing behind the Palace we followed a narrow path up a steep ascent, and then through a wood for some way; this we had been told was a road leading to Kronstadt. On emerging from the wood we came upon a curiosly formed rock, like an old Fortress, from whence we had a good view of Sinaia. Here an old Monk met us, who said he belonged to the Monastery, but that he was out for a holiday; we enquired if it were far off? "About five hours from Sinaia" was his reply, so we concluded that it must be five hours according to his rate of walking, and that with horses we should not take half that time, but we found the road became much steeper as we proceeded and at last we were obliged to dismount and lead the horses: we walked on thus for some distance, when we reached a level spot not far from what appeared to be the top of the mountain. The veiw from here was splendid, so we determined to rest awhile and have our repast: we saw below us the Sinaian Valley, with river and road winding along side by side, and far away range after range of hills, the swiftly passing clouds casting soft blue shadows over the landscape and producing ever-varying effects of light and shade. The distance was very clear and to the left we could distinguish the tin roofs of some very large town, flashing out brightly in the sunlight. The woods near us were already showing signs that summer was past, and that the trees, like fashionable ladies, were beginning to adorn themselves in new autumn tints. The fresh mountain air had considerably sharpened our appetites, and had it not been for the prudent suggestion of one of our party, that we might possibly be glad of something eatable before we reached home again, I believe everything would have been disposed of: so we carefully secured the remainder of our feast, and set off again in quest of the Monastery. Arrived at the top of the hill, which really proved to be further off than we imagined, we found the road led down into a valley, through which flowed a stream, but no sign of any building could we discover. It was now 4 p.m., and a long discussion ensued as to the advisability of continuing our search: the more prudent of our party were for giving it up, and returning to Sinaia, but there is a great charm in open air life, and the young especially if possessed of good health, cannot fail to enjoy at least for a short time, what is commonly called "roughing it," so the majority of us voted for going on, secretly hoping that we might be obliged to remain at the Monastery all night. It was finally settled that one of the gentlemen should return and inform our friends in Sinaia that possibly we might not be home till the following day, and we continued our way along the little stream and then over the opposite hill, from which we looked down upon a lovely valley far below us, and the steep rocks in front were covered with most curiously shaped trees, one in particular resembling the dome and cupolas of a Turkish Mosque. The path down was

very rough and we were obliged to dismount. After walking some time, we saw two small houses, where we hoped we might obtain directions as to our route, but to our disappointment we found one was deserted and almost in ruins, and the other only a saw mill. Here we rested awhile, and again it was suggested that it would be wiser to retrace our steps even at the risk of reaching Sinaia after dark, than to pass the night in the open fields.

But we did not like the idea of beating a retreat without attaining our object, and we felt sure the monastery could not be far off; and then the saw-mill, surely the people who worked it must live near; so leaving three of our party at the mill we set off to find the house. Ah! what do we see in the distance up a ravine? some pigs! We turned and waved to our companions, for of course where there are pigs there must be someone to look after them, so we pursued them, hoping they would run home: but after leading us into a thicket where there was no sign of a habitation, they suddenly disappeared, all but one old porker who, having found a delicious morsel by the stream, had stopped to devour it. With shouts we follow him, he jumps the stream and tears up the opposite hill. We keep him in sight, and sure enough on turning a corner we come upon a farm, and to our delight a human being. We accost him in English and various foreign languages, but failing to make ourselves understood, we carry him back in triumph to our interpreter. Yes, we should succeed at last, for there was a Monastery away to the right, and the intelligent native offered to conduct us thither, and moreover he told us they had plenty of accommodation there, and good beds. We lost no time in mounting our horses, and dwelt with delight upon the prospect of having shelter for the night, and a good supper in the Monastery, for though we had not the faintest hope of coming across venison pasties, or anything like the good cheer enjoyed by the monks of old, it was pleasant for hungry folks to speculate upon what they would get. Half-an-hour brought us to the Monastery in such an out-of-the-way place, shut in between tremendously high rocks, and on the top of each eminence was a cross, as also on every mound by the way side. The buildings of the Monastery were close under the rock, and behind was a dark cave. Two monks came out to meet us, they and the one we met in the morning were the only people who lived there. There were two rooms for strangers, and the good beds were low wooden stands with straw over them, and one had the additional luxury of a sheep-skin. Then came the question of food: the monks had nothing, positively nothing; if we had only come an hour sooner some men had been there with provisions, but there was a place some way off where we could get things, they were quite sure, so we sent off our intelligent guide with some money, and told him to come back quickly with provisions for ourselves and hay for the horses. In the mean time the old monk showed us the little Church, and took us through

the cave, which went back a long way, and at the farthest corner there was a spring: there is a great quantity of beautiful water all through these hills. When we had been the rounds, our interpreter did his best to get what he could from the monks: after a good deal of talking a chicken was discovered and bargained for: it was slain at once, popped into hot water, and plucked. This was something at any rate, and our man said he knew the monks had plenty, but they were such "awful screws," and he walked about with his arm round the monk, trying to coax him to give us something else. When it was too dark to see any longer, we went into the Monastry, and the kitchen fire looked so tempting we ventured to draw near it: it was on a raised hearth with a wide chimney and seated round it we discovered the rest of our party, watching the preparation of the chicken with hungry eyes: that precious fowl which was to furnish supper for eight famished beings was now ready for roasting: it rested on a filthy table, and the dirty hands of the younger monk were engaged in pushing a stick through its body: to this its legs were tied by a piece of string, and then it had to be turned round and round before the fire till it was cooked. We all sat round and tried to make out how much everyone would get when the chicken was divided, which was rather amusing. Presently in came the old monk: he stood at the door in an attitude of surprise, and anger, pointing to the candle (a tallow dip) and the blazing fire, evidently the poor kitchen monk was getting scolded for wasting the candle, when there was light enough without it: so the candle was blown out. We each took a turn at the chicken, twisting it round and round, and treating our monk to a little singing; he meanwhile getting some indian cornflour to make a kind of bread called mamalika. In a few minutes our interpreter appeared in triumph with 8 eggs, which he had got from the old monk: 4 really belonged to him, but the others he had taken from the absent monk's store, on condition that our man should pretend we had brought them with us from Sinaia: you've no idea what wicked old monks they are. We thought the chicken roasted very slowly, every now and then the monk gave it a pinch to see if it was done, and three times he took it to the table and poured cold salt and water over it. At last it was ready and then supper was served in our room: we had 4 hard boiled eggs, some ham sandwiches, and a very small quantity of bread left from our mid-day meal, and the monks had provided 8 fresh eggs, some very sour cream, a bottle of milk (which we left for the morning but which turned out undrinkable) mamalika, of which a little went a very long way, and the chicken! Hungry as we were, none of the ladies could touch the chicken after having seen the process of cooking, so they contented themselves with eggs knowing they were clean, but it was rather difficult to eat them elegantly without spoons. When the banquet was finished we went to see after the horses; we had quite given up all hope of

seeing anything more of our guide or the equivalent for our money, and we threatened to invade his farm and carry off some pigs next morning: we found the horses had been put in the cave and some hay had been procured for them, so they were tolerably well cared for. A large fire had been lit on the floor, and our weird, distorted shadows looked very ghostly by the flicker of the fire light. Having to start at daybreak we retired as soon as possible to get what sleep we could, and at early dawn we prepared to leave the Monastery, shivering and shaking, and no wonder, for the ground was white with frost and there was ice on the water. The kitchen monk came with us part of the way to show us a short cut and unfortunately led us through a bog, where one of the horses rolled over, but we soon got him out, and were glad to find that beyond a dreadful fright, the poor animal had sustained no injury. We had started soon after 5 o'clock, and at 8 it began to be very hot, and moreover as the road was extremely steep we were obliged to walk, but it was not for long as at about 9.30 a.m. we reached Sinaia, and were we not glad of a cup of hot coffee, as we had had nothing that morning but cold water. Strange to say we none of us were very tired, and even had we been, the pleasant reminiscence of this most enjoyable excursion, would amply have repaid us for any trouble and fatigue we had undergone, and I feel certain we shall none of us ever forget our night in the Monastery. Sinaia is not so isolated as one might imagine, for there is telegraphic communication with all parts of Europe: the Roumanians have laid down underground telegraphs, a much more expensive way than on poles, but it is with the idea of preventing people cutting the wires in case of insurrection."

The country possesses great capabilities, of which however but little advantage has yet been taken. The soil is exceedingly fertile, and notwithstanding a very inferior state of agriculture, produces every kind of grain, fruit, and vegetable in the greatest abundance. In the elevated parts of the country there are extensive pastures for sheep, and numbers of horses and cattle are fed on the rich meadow land lying near the rivers. There is abundance of rock salt in the vicinity of the Carpathian mountains, and the Szill Valley is very rich in coal; the other mineral productions are iron, copper, lead, silver, bitumen, and small quantities of gold in the sands of some of the rivers. There are vast forests of firs, oaks, and beeches, which serve as shelter for every description of game, but bear and chamois hunting is more especially the sport of the Carpathians, and sportsmen come from great distances for the purpose of shooting them.

ORNITHOLOGICAL SECTION.

In the course of the summer term several interesting meetings of this Section were held, at which the habits of less common birds were discussed. The following were the exhibitions most worthy to be recorded.

Spotless Jay's Eggs.—These eggs were like those of a Starling of a light blueish colour; on some of them it was just possible to make out faint markings. They were taken out of a Jay's nest: and one was presented to the Society.

Chough's Egg.—Presented to the Society by J. S. and N. Masterman.

Sparrow-hawk's Eggs.—Very small, and almost pure white.

Among the rarer birds which have been seen in the neighbourhood this year, should be noticed

Peregrine Falcon.—Seen March 14th, by the keeper (Brown) at Totterdown.

Whimbrel.—Of which one specimen out of a flock of 6 was shot near Berwick Bassett. May 13.

Curlew.—One bird seen March 17; and four more, April 5.

Wryneck.—Shot. April 29.

Sand-Piper.—Seen at Littlecote, May 13, (E.S.M.); and *Snipe* seen April 25.

It was suggested at one Meeting that it would be interesting to know if the actual fir trees are still standing in the forest from which Ravens' eggs have been taken within the memory of Old Marlburians. Also to prove beyond doubt the assertion in "The Birds of Marlborough," that Jackdaws (at Rookley and elsewhere) will build open nests, when there are no hollow trees at hand,—by presenting a nest of this description with eggs to the Museum.

Names of those whose initials occur in the following List:—

T.G.B.	... ...	T. G. Balfour.
P.H.B.	... ...	P. H. Bryant.
S.L.B.	... ...	S. L. Bullock.
W.O.C.	... ...	W. O. Charlton.
A.H.D.	... ...	A. H. Davis.
F.M.D.	... ...	F. M. Drysdale.
F.H.F.	... ...	F. H. Furnival.
J.B.H.	... ...	J. B. Hartley.
H.R.H.	... ...	H. R. Hordern.
C.W.B.J.	... ...	C. W. B. Jones.
W.E.L.	... ...	W. E. Lascelles.
E.S.M.	... ...	E. S. Marshall.

N.M.	...	...	N. Masterman, Esq.
P.C.M.	...	...	P. C. Millard.
W.M.R.	...	...	W. M. Richards.
G.R.R.	...	...	G. R. Rogers.
M.R.	...	...	M. Rogers.
H.E.S.	...	...	H. E. Stanton.
C.H.T.	...	...	C. H. Thring.
H.E.T.	...	...	H. E. Tombe.
W.T.W.	...	...	W. T. Webb.

Kestrel—4 Ap. 26, (*Coleman*); 6 eggs, May 25.
Sparrow Hawk—eggs, May 4, P.C.M.; 6 eggs found in one nest.
Long-eared Owl—young flying, May 8, (*Coleman*).
Tawny Owl—4, Feb. 30, W.T.W.; H.E.S.; young fledged, March 26, (*Coleman*).
Red-backed Shrike—seen, May 10, E.S.M.; eggs, May 29th, E.S.M.
Spotted Flycatcher—seen May 12; eggs, June 2, E.S.M.
Missel Thrush—April 1, (*N. Manders.*)
Song Thrush—nest with eggs, Feb. 25, (*Mr. Selfe*, of Marten, near Bedwyn, in *Marlborough Times.*)
Blackbird—building, March 30, E.S.M.
Redbreast—4, April 2, F.M.D. and M.R.
Stonechat—seen, March 20.
Wheatear—mislaid egg, May 7, N.M.
Grasshopper Warbler—heard, July 6, T.G.B.
Sedge Warbler—May 17, F.H.F., C.H.T.
Reed Warbler—seen, May 12, E.S.M.
Nightingale—heard, May 20.
Blackcap—heard, May 11, E.S.M.; egg, May 26, A.H.D.
Garden Warbler—seen, May 10; eggs, May 23, E.S.M.
Whitethroat—seen, May 4, E.S.M., T.G.B.
Lesser Whitethroat—eggs and young, May 23, E.S.M.; eggs, May 30, E.S.M.
Wood Warbler—4, June 5, H.E.T.
Willow Warbler—6, May 20, E.S.M.
Chiff-Chaff—eggs on Common, W.M.R.; ditto, May 18, H.R.H., W.E.L.
Golden-crested Regulus—eggs, (hard set), May 17, F.H.F., S.L.B.
Greater Tit—8, May 9, G.R.R., M.R.
Blue Tit—7, May 16, E.S.M.
Tree Pipit—Eggs, May 25.
Skylark—3, May 11, N.M.
Yellow Bunting—May 23, E.S.M.
Chaffinch—1, May 8, E.S.M.
House Sparrow—May 25, P.H.B.

Greenfinch—May 6, E.S.M.

Goldfinch—young, May 6, W.M.R.

Linnet—4 and 3, May 10, E.S.M.

Bullfinch—2, June 1, F.M.D.

Starling—eggs, (hard set), May 4, G.R.R., M.R.

Carrion Crow—young, May 13, (*Coleman*).

Rook—5 and 4, March 16, T.G.B; young, Ap. 5, T.G.B., F.M.D.

Jackdaw—building, April 2; 3 eggs, May 4, T.G.B., F.M.D.; young, May 13, (T.G.B., E.S.M)

Magpie—May 9th, T.G.B.; young, May 18, F.M.D.

Jay—light-blue eggs like those of a Starling, May 12, J.B.H.

Green Woodpecker—2, May 11, M.R., C.W.B.J.

Creeper—building, May 16, E.S.M.; May 27th, G.B.H.

Wren—2 young, May 7, G.R.R.

Nuthatch—May 20, M.R., W.O.C.

Cuckoo—heard, May 3, T.G.B.

Kingfisher—2, May 29th, E.S.M.; 4, May 31, H.E.T.

Swallow—seen, April 4, T.G.B.

Martin—building, May 11, E.S.M.; (several nests were begun this year on the porch of the College Hall, for the first time).

Sand Martin—eggs, (hard-set), June 3, F.M.D.

Swift—seen, May 10, E S.M.; young, June 29, T.G.B.

Ring Dove—April 1, (*N. Manders.*)

Stock Dove—building, May 4, E.S.M., F.M.D; Eggs, May 20, C.W.B.J., G.R.R.

Turtle Dove—seen, May 14th, T.G.B., E.S.M.; egg, June 10, T.G.B.

Pheasant—13, May 10, T.G.B.

Peewit—1, April 6, (Keeper); young, May 16, (nearly fledged), G.R.R.

Land Rail—heard, May 4, E.S.M.

Moorhen—1, Ap. 6, T.G.B., E.S.M.; young, May 13, E.S.M.

Coot—3, Ap. 6, T.G.B., E.S.M.

Wild Duck—11 (fresh), Ap. 3, T.G.B.; 8 (hardset), Ap. 6th, T.G.B., E.S.M.; young, May 25.

Little Grebe—summer plumage, Ap. 6, T.G.B., E.S.M.; 1, Ap. 3; young full-grown, May 29, T.G.B.

Great Spotted Wood-pecker—building, Feb. 29, (keeper *Brooks*); ditto, May 11, G.R.R., M.R.

ENTOMOLOGICAL NOTES.

DURING last term one new species, *Helice*, has been added to the *Rhopalocera*; two, *Spadicea* and *Festucæ*, to the *Noctuæ*; and one, *N. Catharticella*, to the *Micros*. The following are among the most noteworthy.

Colias Hyale.—The first appearance of this insect was in 1868, at Ramsbury, but in August of this year more than a dozen specimens have been taken mostly on the Railway Bank.

C. Edusa var. *Helice*—Two specimens in a clover field, near the Railway Bank.

Limenitis Sibilla.—A few years ago this was not known to occur here, but now unaccountably it is common enough.

Thecla W. Album, same as above.

Pamphila Comma—Taken singly before, but is abundant on Martinsell.

Cerastis Spadicea—New to Marlborough, but is common on Ivy Blossom.

Eremobia Ochroleuca—This is the third Marlborough specimen taken flying in the sun on the Railway Bank.

Plusia Festucæ—Inserted before by mistake; is rare, flies in gardens at dusk.

Chimabacche Phryganella—The first occurrence of this insect was last year at Thrup Wood; has since occurred in the Forest.

Chauliodus Chærophyllellus—One specimen at Preston, previously of doubtful occurrence.

Nepticula Catharticella, new; but the larvæ are common at Ramsbury.

In consequence of the absence of E. Meyrick, Esq, from Ramsbury, the *Micros* are very badly worked up.

Where there are no initials, I am responsible.

N. MANDERS.

RHOPALOCERA.

Gonepteryx Rhamni	...	abundant	Aug. — Dec. 25.
Colias Edusa		ditto	Aug. 16.
C. Hyale		see note	Aug. 21.
var. HELICE		see note	Aug. 29.
Pieris Brassicæ		abundant	Aug. 9.
Rapæ		ditto...	Aug. 10.
Napi		ditto...	Aug. 13.
Arge Galathea		common at Stype	Aug. 7.
Lasiommata Megæra ...		common	Aug. 30.
Hipparchia Semele ...		Sav. Forest Hill, common	Aug. 8.
Janira ...		abundant	
Tithonus ...		ditto	
Hyperanthus		ditto	

Pamphilus ...	ditto		
Sibilla ...	common at Stype		Aug. 7.
Cynthia Cardui	common		Aug. 16.
Vanessa Atalanta ...	common		Oct. 16.
Io	ditto...		Oct. 1.
Polychloros ...	not rare		Aug. 11.
Urticæ	abundant		Aug. 12.
Argynnis Paphia	common		Aug. 7.
Adippe... ...	common		Aug. 10.
Aglaia	ditto		Aug. 10.
Thecla W. Album ...	Froxfield Road		Aug. 7.
Chrysophanus Phlæas ...	abundant		Sept. 8.
Polyommatus Argiolus ...	near Holly		Aug. 10.
Corydon ...	common		Aug. 16.
Alexis ...	ditto...		Aug. 8.
Agestis ...	ditto...		Aug. 30.
Pamphila Comma ...	see note		Sept. 2.
	SPHINGINA.		
Anthrocera Filipendulæ ...	abundant		Aug. 9.
Smerinthus Ocellatus ...	larva		Aug. 26.
Sphinx Ligustri	pupa dug		Dec. 18.
Macroglossa Stellatarum	uncertain		Sept. 2.
	BOMBYCINA.		
Hepialus Sylvinus ...	flying at dusk		Aug. 11.
Cossus Ligniperda ...	larva on a hurdle		Sept. 3.
Cerura Vinula	pupa at roots of Poplar ...		Sept. 28.
Diloba Caeruleocephala ...	at light		Oct. 11.
Petasia Cassinea	at rest		Nov. 4.
Pygæra Bucephala ...	larva		Sept. 18.
Orgyia Pudibunda ...	larva		Sept. 4.
Antiqua	common		Sept. 7.
Spilosoma Menthastri ...	larva		Sept. 15.
Lubricepeda ...	larva		Sept. 4.
Poecilocampa Populi ...	at light		Nov. 3.
	NOCTUINA.		
Gortyna Flavago	at light		Sept. 5.
Hydræcia Nictitans ...	Forest		Aug. 9.
Micacea ...	at light		Sept. 29.
Testacea ...	at light		Sept. 14.
Triphæna Janthina ...	at light		Aug. 16.
Pronuba ...	at light		Aug. 28.

Noctua Xanthographa ...	Railway Bank	Sept. 1.
Tæniocampa Instabilis ...	At Sallows	April 1.
Stabilis ...	ditto...	April 1.
Cruda ...	ditto...	April 1.
Orthosia Macilenta ...	Ivy Bloom	Oct. 2.
Anthocelis Pistacina ...	Ivy Bloom	Oct. 2.
Lunosa ...	at light	Sept. 8.
Cerastis Vaccinii ...	Ivy Bloom	Oct. 20.
Spadicea ...	Ivy Bloom	Nov. 3.
Scopelosoma Satellitia ...	Ivy Bloom	Oct. 24.
Xanthia Silago	at light	Sept. 14.
Ferruginea ...	at light	Oct. 2.
Cosmia Diffinis	at Sugar	Aug. 12.
Eremobia Ochroleuca ...	see note	Aug. 23.
Miselia Oxyacanthæ ...	Ivy Bloom	Oct. 6.
Phlogophora Meticulosa	at Sugar	Sept. 3.
Xylocampa Lithorhiza ...	at Sallows	April 1.
Xylina Semibrunnea ...	Ivy Bloom	Oct. 30, Nov. 3.
Brephos Parthenias ...	Sav. Forest	April 1.
Plusia Festucæ	see note	Sept. 23.
Gamma	abundant	Aug. 8.
Gonopetera Libatrix ...	common	Oct. 5.
Catocala Nupta	common	Sept. 9.
	GEOMETRINA.	
Ourapteryx Sambucaria ..	larva	Oct. 6.
Epione Apiciaria	at dusk	Sept. 19.
Hibernia Rupicapraria ...	at dusk	Jan. 24.
Defoliaria ...	at light	Oct. 25.
Cheimatobia Brumata ...	abundant	Oct. 20, Jan. 24.
Dilutata ...	ditto...	Nov. 23.
	TORTRICINA.	
Dictyopteryx Contaminana	abundant	Sept. 28.
	TINEINA.	
Chimabacche Phryganella	see note	Oct. 24.
Depressaria Subpropinquella	Rably	Sept. 28.
Applana ...	common	Sept. 28.
L. Quercifoliella	common	Oct. 18.
Anesychia Decemguttella	larva common; Loves and Thrup Wood.	Sept. 24, October 6; E. Meyrick, Esq.
Chauliodus Chærophyllellus	see note	Oct. 3rd, E M.
Nepticula Catharticella	ditto	Sep. 29, Oct. 5; E.M.

BOTANICAL REPORT.

There has not been very much done in Botany this term, except what has been observed by Rev. J. Sowerby, who however has been enabled to give us a very accurate account of the state of vegetation. No *new* species has been discovered, but one, discovered after the printing of the last list of notices (but included in the part of the "Flora" published in the last Reports) may be mentioned here, viz.

Verbascum Blattaria—discovered at Mildenhall by the Rev. C. E. Thorpe.

Besides this may be mentioned—

Helminthia echioides, which is really a re-discovery by Rev. J. Sowerby. About 10 or 12 years ago a single specimen had been brought "from Martinsell," but the exact locality could not be found again till this autumn: it has been discovered at Binck Knoll.

Epipactis latifolia—1 mile N. of Chisbury, *Rev. J. Sowerby*.

Tragopogon pratensis—Railway bank, *Rev. J. Sowerby*.

In order to shorten this Report, the full table of notices is omitted, but it may be stated that

Up to Sept. 19...	...	214 plants were found in flower.	
„ Oct. 17 ...	...	134	„ „
„ Nov. 1 ...	...	214	„ „
„ Nov. 9 ...	...	127	„ „
On Nov. 14, 15...	...	64	„ „

DONATIONS TO THE MUSEUM.

Specimens of Stalactitic Iron	Miss E.A. Ormerod.
Specimens of *Dynastes Hercules*	W.S.M.D'Urban,Esq.
Gold Coin of the Emperor Honorius (A.D. 395—423), dug up at Fyfield	Mr. Chivers.

ADDITIONS TO THE LIBRARY.

Taylor's Notes on Collecting and Preserving Specimens...	Rev. T. A. Preston.
Tristram's "Great Sahara"...	"
Kane's "Arctic Explorations"	"
Barff's Chemistry	"
Livingstone's First Expedition to Africa	"
Nature I—XII.	"
Nature XIII, &c.	Purchased.
Wallace's "Malay Archipelago"	"
Darwin's "Insectivorous Plants"	"
Wallace's Geographical Distribution of Animals ...	"
Entomologist for 1875, 1876	Rev. T. A. Preston.
Entomologist's Monthly Magazine—1875, 1876... ...	"
Science Gossip—1875, 1876...	Purchased.
Microscopical Magazine	"
Geological Magazine	"
Popular Science Review to end of 1876	"
Yarrell's British Birds (Edit. Newton) parts 9, 10 ...	Rev. T. A. Preston.
Rodwell's "Birth of Chemistry"	The Author.
Proceedings of the New Zealand Institute—VII, VIII ...	The Institution.
Mier's Catalogue of New Zealand Crustacea	"
Acoustics, Light and Heat	R. B. Dods.
Wilts Archæological Magazine—XV, XVI.	

ACCOUNTS.

RECEIPTS.	£	s.	d.
Balance in hand	19	11	11
Subscriptions—Members	2	8	0
Hon. Mem.	4	7	0
Composition	2	2	0
Field Day last Term	6	9	6
Report, Christmas, 1875...	11	3	6
„ Midsummer, 1876	68	16	0
"Antiquities"	8	0	0
Fines, &c.	1	5	6
	£124	3	5

EXPENDITURE.	£	s.	d.
Museum account	19	4	4
Library account	9	12	1
Publishing Report	72	2	3
Sundries	0	19	3
Balance in hand	22	5	6
	£124	3	5

STANTON PRIZES.

I.—The Subjects for the Stanton Prizes will be divided into two groups:

(i) Botany and Physics.

(ii) Entomology, Geology, and Ornithology.

II.—Candidates will have to pass a Preliminary Examination in the elements of their own subject, and of one other of the subjects set for that year; after which, *if passed satisfactorily*, they will be examined in their own special subjects.

III.—In addition to these two Examinations, a certain amount of practical work will have to be sent in.

IV.—The books required for the Preliminary Examination will be—

Botany—Oliver's Botany (chapters, 1, 2, 3, 8).

Physics—Balfour Stewart's Physics (1s. edition).

Entomology—Dallas' Elements of Entomology (chapters 1, 2 and 3).

Geology—Bonney's Manual of Geology (1s., published by S.P.C.K.), chapters 1 to 6.

Ornithology—Stanley's History of Birds (2 and 3).

V.—The special subjects and practical work shall be changed every year, and shall be given out as soon as possible after the announcement of the prizes gained for the previous year.

SUBJECTS FOR 1877.

The Prizes this year will be given for Entomology, Geology, and Ornithology.

(1) *Preliminary* Examination, see rule iv.

(2) *Special* Examination.

(*a*) *Entomology*—Dallas' Elements, chapters iv., xii.

(*b*) *Geology*—Remainder of Bonney's Manual and Jukes' School Manual of Geology.

(*c*) *Ornithology*—Remainder of Stanley's History of Birds.

(3) Practical Work.

(*a*) *Entomology* (i)—A Collection of British Butterflies; and (ii) Drawings of the *veins* of the wings of the different species.

(*b*) *Geology* (i)—A series of Marlborough Chalk Fossils, of all species.

(ii) A Map of the Country four miles round Marlborough.

(*c*) *Ornithology* (i)—A Calendar of Observations kept from March 1st to June 30th.

(ii) A collection of Birds' eggs, subject to the rules given below, which must be strictly observed.

REMARKS.

As regards the Collection of Butterflies, the following conditions must be observed as far as possible.

(i.)—A male, female and underside of each species must be sent in, if possible.

(ii.)—Any *remarkable* varieties may also be sent in.

(iii.)—*Bred* specimens will be considered of more importance than *captured* ones.

(iv.)—Every specimen must be numbered, corresponding with a number in a note book (which must accompany the collection), in which are given the dates and localities of capture, and any other remarks worth recording.

(v.)—In the case of *bred* specimens, notes of transformation, &c., may be entered; the more complete, the better.

(vi.)—One half, at least, of the number of specimens sent in must have been captured near Marlborough.

(vii.)—Each candidate must be prepared to certify that every specimen in his collection was either captured or bred by himself.

As regards the collections of Chalk Fossils and Map.

(i.)—In all cases the *localities* where the fossils were obtained, must be given.

(ii.)—Names as far as possible should also be added.

(iii.)—As many particulars as possible (especially *localities*) may be written on the specimens, in such places where they would suffer no injury by so doing, but it will also be advisable to number each specimen, by writing on it (not gumming a label), and in an accompanying note book giving all further details.

(iv.)—Besides a typical specimen of each species, other specimens may be added, illustrative of structure or other points of interest, but in all such cases, the special points of interest must be mentioned in the accompanying note book.

(v.)—The map should be coloured geologically, patches of gravel or clay carefully marked, also all chalk-pits and cuttings, which may be numbered, so as to serve as a reference map to the note book.

(vi.)—The fullest remarks may be made in the note book, and any remark which results from the actual *observation* of the candidate, will be considered of great importance.

As regards the Ornithological Calendar, candidates are recommended to read a short article on the subject, by Professor Newton, a copy of which is in the Society's Library, but perhaps it may be as well to mention that all remarks about the migration, singing, pairing, nesting, frequency of even the commonest species, are all fit subjects for the Register, besides any unusual or remarkable facts which may be observed by the candidate.

The rules to be observed with respect to the collection of Birds eggs are as follows:—

(i.)—Only *one* specimen of a species to be collected.

(ii.)—The candidate must be prepared to declare that, to his knowledge, the specimen sent in is the *only* specimen of that species he has taken this year.

(iii.)—Should a specimen be broken or damaged so as to render it unfit to be sent in, a second may be taken, but this must be stated in the note book. No *third* specimen will be allowed.

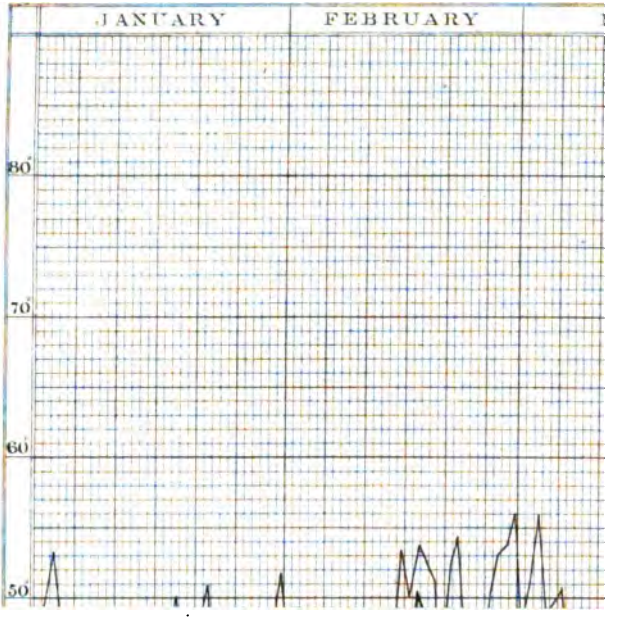
(iv.)—Each specimen must be marked in ink with a number corresponding with a number in an accompanying note book.

(v.)—In the accompanying note book must be recorded the date when and locality where each specimen was collected, the position and structure of the nest and any other particulars worth recording.

(vi.)—The candidate must be prepared to state that every specimen sent in was collected by himself.

BOYS ADMITTED SEPTEMBER 15th, 1876.

No.	Name.	Form.	House.	Born & Age.	Height. ft. in.	Weight. st. lbs.	Circumference of head. in.	chest. in.	arm. in.	leg. in.	Place of birth.
223	Aldworth, A. E.	L. Shell	H.R.	May 64—12¼	4 6	4 11¼	20¼	25	6⅛	9¼	Lancashire.
298	Alston, G. C.	Mid. 4, b	L.E.U.	Feb. 62—14½	4 11½	6 12¾	21¾	28½	8¼	12	Glasgow.
33	Alston, F. S.	Low. 4	H.B.H.	Dec. 63—12¾	4 10½	6 3½	21	27½	7½	11	Suffolk.
86	Atkins, P. C.	Low. 3	H.R.	Sep. 63—13	4 6½	5 6	21½	26	7¼	11	London.
479	Baker-Gabb, R. F. H.	Up. 3	F.E.T.	June 64—12½	4 6½	5 7½	21	25½	7½	11	Monmouthshire.
567	Beale, S. M.	Mid. 4, b	J.B.G.	Nov. 61—14¾	4 10½	6 10½	21½	28½	8½	12	Worcester.
528	Bramwell, G. A.	Mod. L., 2	W.E.M.	Dec. 62—13¾	5 1¾	6 13	21	27½	8¼	12	Suffolk.
290	Brooke, L. N.	Low. 4	H.R.	Sep. 62—14	5 3½	7 10	21¾	29½	8½	12	Cheshire.
435	Burge, H. M.	Low. 5, (1)	J.B.G.	Aug. 62—14	5 3½	7 3¾	22	28½	8	11¾	Meerut, India.
465	Caldecott, P.	Low. 4	F.E.T.	July 62—14	4 10½	6 2½	22	26¾	7¾	11	Surrey.
247	Casson, F. G.	Low. 4	H.B.H.	Mar. 64—12½	4 10¾	5 10½	21	27	7¼	10½	Northants.
104	Chichester, A. G. V.	Low. Shell	H.R.	Jan. 65—11¾	4 7¾	5 12¾	21	26	8	11	Antrim.
349	Christopherson, C.	Mod. L., 2	W.M.	Oct. 62—14	4 8¾	5 10	21½	26	7½	11	Kent.
534	Cooke, T. W.	Low. Shell	W.E.M.	June 64—12½	5 0¾	6 12	21	28	7¾	11⅜	Liverpool.
120	Craufurd, J. A. H.	Mod. L., 1	L.E.U.	May 62—14¼	5 3½	8 4¼	21½	28¾	9¼	12¾	Dresden.
96	Cross, R. G.	Low. 4	H.B.H.	Feb. 63—13½	5 3½	8 13¾	21½	31	9	13	Hants.
451	Curtler, W. H. R.	Up. 4, a	J.B.G.	Jan. 62—14¾	5 7¾	9 4	22½	31	9½	13	Worcester.
255	Curtois, A.	Low. 3	H.R.	Oct. 65—11	4 5½	4 8	21	24½	7	9¾	Lincolnshire.
301	Davidson, W. L.	Low. 5, 1	W.M.	Aug. 62—14	4 7¼	5 8½	20¼	27¼	7½	11	Peshawur.
472	Davie, W. J. F.	Mid. 4, b	F.E.T.	June 63—13¼	4 11	6 8	20½	27½	8	11¼	London.
346	Dawson, C. F.	Low. 4	W.M.	Sep. 62—14	5 5½	7 5¼	21½	29	8¼	12	London.
270	Dixon, A. E.	2nd F.	H.R.	Oct. 64—12	5 0	6 6	22	26½	7½	10¾	Sheffield.


JANUARY
FEBRUARY
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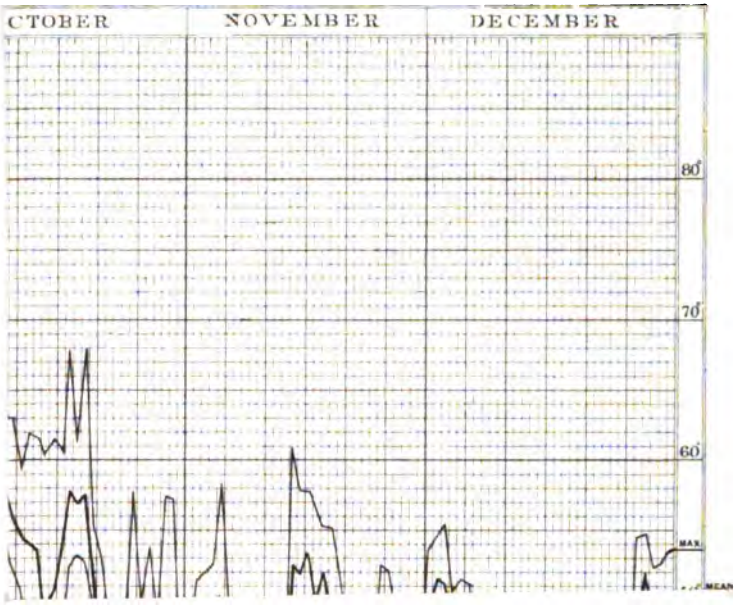

JANUARY, 1876.

Days of Month.	Mean Readg. of Barometr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Temperature. In the Shade. Lowest.	Temperature. In the Shade. Adopted Mean.	Temperature. Highst insun's rays.	Temperature. Lowst. on the grass.	Wind. Direction. A.M.	Wind. Direction. P.M.	Wind. Velocity Miles	Mean amt. of Cloud (0-10)	Rain.
	in.	°	°	°	°	°					in.
1	30·064	47·8	32·3	40 0	47·5	34·0	S.W.	N.	160	5·0	·23
2	·114	49·6	26·5	38·4	48·8	26·2	S.E.	W.	102	10·0	·32
3	·198	53.3	43·7	47·8	63·0	40·0	W.	N.W.	169	7·0	·01
4	·301	47·8	43·1	44·7	53·3	39·4	W.	S.E.	47	9·5	
5	·412	44·9	29 8	35·4	52·2	26·4	S.E.	E.	67	5·5	
6	·442	32·0	26·3	29·2	44·3	23·2	S.E.	E.	111	7·5	
7	·273	33·5	27·4	29 5	43·8	26·2	E.	E.	146	7·0	
8	·086	28·2	22·6	24·8	32·7	23·2	E.	E.	205	10 0	
9	·141	30·7	19·9	26·2	38·5	18 2	N.E.	N.	71	8·5	
10	·366	33·2	29·8	31·7	38·6	27·5	N.E.	N.	148	9 5	
11	·291	35·2	26.9	30·5	61·0	24·2	N.	E.	125	10 0	·04
12	·210	33·2	22·1	28·1	36·2	17·4	S.	W.	57	8·5	
13	·339	34·2	29·5	31·4	41·8	25·4	E.	N.E.	137	10 0	·16
14	533	33·8	28·8	31·8	40·3	28·7	N.E.	E.	252	10 0	
15	·668	32·9	25·9	29·1	45·6	26·2	E.	N.E.	144	10·0	
16	.548	36·0	21·9	28·9	63·6	23·6	W.	N.W.	79	7·5	·07
17	.261	45·2	34·1	40·5	45·5	31·7	W.	N.W.	106	10 0	·05
18	·166	50·0	33·5	40·4	90·0	28 0	W.	N.W.	168	7·0	
19	30·130	45·8	33·5	41·4	54·0	32·0	S.W.	S.W.	152	10·0	·01
20	29·801	46·8	43·7	45.4	49·8	42·2	S.W.	S.W.	233	10·0	·07
21	29·704	47·8	31·8	38·9	48·5	32·7	S.	N.	172	10·0	1·51
22	30·360	37·9	22·6	28·0	38·0	18·0	N.W.	N.W.	107	1·5	
23	·481	40·2	21·3	32·5	38·3	16·5	S.E.	W.	91	2·5	
24	·546	47·8	36 5	41·7	71·1	33·1	S.	S.W.	144	7·0	
25	·447	46·1	33·3	38·1	73·2	32·0	S.S.E.	E.	87	6·0	
26	·373	47·4	33·2	40·0	61·5	30·3	E.	S.	79	8·0	
27	·336	46·8	39·0	42·2	51·9	35·4	S.	S.	89	6·0	
28	·332	47·0	39 4	41 5	84·3	39·4	S.E.	S.	45	10·0	
29	·349	49 0	31·5	37·4	88·0	30·4	E.	S.	65	5 0	
30	·348	47·1	34·3	41·6	51·2	29·8	S.	S.	100	10·0	·04
31	30·383	51·8	41·4	44·7	86·0	39·2	S.	S.	135	7 0	
Mns	30·290	42·0	31·1	36·2	57·5	29 0	...	...	Sum 3793	7 9	Sum 2·51

FEBRUARY, 1876.

Days of Month.	Mean Readg. of Baromtr, reduced to Sea level.	Temperature. In the Shade. Highest.	Lowest.	Adopted Mean.	Highst insun's rays.	Lowst. on the grass.	Wind. Direction. A.M.	P.M.	Velocity. Miles.	Mean amt. of Cloud (0-10)	Rain.
											in.
1	30·124	47°0	40°5	43°1	81°0	37°4	S.	W.	164	10·0	·12
2	·284	49·4	35·1	39·7	93·1	32·1	W.	W.	158	4·0	
3	·246	47·8	35·5	40·6	84·4	31·0	S.W.	S.W.	170	8·0	·13
4	30·061	44·4	32·3	36·3	82·6	29·2	W.	N.	183	0·5	·03
5	29·960	38·9	30·9	33·7	77·9	28·3	N.	N.	177	6·0	·01
6	·974	36·8	31·5	33·6	48·3	29·2	N.	N.E.	151	9·0	
7	·984	36·4	32·2	33·6	57·5	31·3	N.E.	N.E.	151	10·0	
8	·979	35·7	31·1	32·9	51·0	30·5	N.	N.	119	10·0	·03
9	·899	38·5	31·6	33·7	73·7	30 8	N.	W.	31	10 0	
10	·956	37·8	26·8	30·3	78·8	22·7	E.	E.	60	7 0	
11	·900	38 4	26·5	30·2	72·5	23·7	E.	N.E.	46	6·0	
12	·884	38·0	20·3	28·0	81·2	17·9	N.E.	W.	21	8·0	
13	·635	33·2	25·3	28·8	63 2	21·8	E.	E.	93	8·0	·20
14	·622	45·9	30·1	39·4	100·2	30·1	S.W.	S.W.	128	9·0	·52
15	·520	53·4	44·1	47·2	90·9	42·7	S.W.	W.	253	5·0	·21
16	·739	49·9	42·0	46 0	61·0	59·2	W.	S.W.	218	5·0	·19
17	·708	53·9	45·7	50·6	66·2	44·9	S.W.	S.W.	300	10 0	·07
18	·351	52·9	46·3	49·0	61·3	45·5	S.S.W.	W.	339	10·0	·25
19	·458	51·5	42·3	45·0	103·6	41·0	N.W.	S.	240	4·0	
20	·739	44·7	39·1	41·8	55·7	38·2	S.E.	N.E.	82	10·0	·37
21	·777	52·5	43·7	49·2	61·1	41·3	S.W.	W.	302	10·0	·01
22	·840	54·5	44·8	48·0	95·1	42·9	S.W.	W.	251	4·0	·11
23	29 846	47·6	37·5	41·8	83·0	34·7	W.	N.W.	372	3·5	·01
24	30·120	45·4	31·7	37·0	91·4	27·7	N.W.	W.	150	7·5	
25	29·699	45·6	35·0	41·4	57·4	34·1	S.	S.W.	146	10·0	·39
26	·477	50·7	43·2	46·6	71·7	42 9	S.W.	W.	196	10·0	·07
27	·560	52·9	43·8	47·1	81·8	42·7	S.	N.W.	304	9·5	·07
28	·849	53·5	43·3	48·4	91·7	41·8	W.	W.	272	10·0	·09
29	29·832	56·0	39·7	46·5	92·3	34 8	S.W.	S.	236	6·0	·23
Mns	29·828	46·0	36·3	40·3	76·2	34·2	...	...	Sum 5313	7·6	Sum 3·11

MARCH, 1876.

Days of Month.	Mean Readg. of Baromtr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest.	Adopted Mean.	Highst insun's rays.	Lowst. on the grass.	Wind. Direction. A.M.	P M.	Velocity. Miles.	Mean amt. of Cloud (0-10)	Rain.
	in.	°	°	°	°	°					in.
1	29·635	48·0	39·0	44·0	60·4	33·7	S.	W.	209	9·0	
2	·811	50·6	38·9	43 9	104·2	37·2	S.W.	W.	327	10·0	·23
3	·728	56·4	44·7	50·1	89·4	44·4	W.	W.	262	9·5	·03
4	·796	48 8	38·4	42·1	98·5	37·0	W.	W.	314	5·5	·06
5	·743	49·8	37·4	44·6	65·8	35·0	W.	W.	235	10·0	·36
6	·745	50·6	42 1	45·8	90·6	40·4	W.	W.	423	8·0	·16
7	·878	43·2	33·9	38·7	97·8	32·4	W.	W.	321	5·5	·05
8	29·386	49·2	37·7	44·7	88·8	35·4	S.W.	S.W.	277	9·5	·21
9	28·791	48·0	31·0	36·7	94·8	30·3	W.	S.W.	346	6 5	·53
10	28·787	48·1	32·0	38·5	99·6	30·5	S.W.	W.	221	8 0	
11	29·206	49·1	35·2	40 8	98·8	32·4	N.W.	N.W.	269	1·5	·58
12	28·962	37·8	30·5	33·2	77·4	26·2	S.E.	S.	214	5·0	·56
13	29·635	44·4	28 9	37·7	113·5	25·3	N.W.	W.	126	5·0	
14	·597	50·1	35·5	44·4	83·2	37·2	W.	W.	479	8·0	·08
15	·421	48·1	35·6	40·2	101·5	32·2	W.	W.	493	5·5	
16	·710	46·0	33·8	39·0	92·9	30·4	W.	W.	242	4 5	
17	29·831	42 8	28 6	34·0	98·8	26·7	N.W.	N.W.	266	4·5	
18	30 054	42·8	28 6	35·0	92·3	26·1	N.	N.	179	7·0	·01
19	·084	36·6	25·3	31·5	83·4	24·4	N.	N.	195	9·5	
20	30·114	40·4	24·7	31·9	94·2	20 7	N.W.	N.	120	0·0	
21	29·890	34·8	26·9	30·8	47·0	21·5	S.	N.	69	10·0	·39
22	·965	39·3	26·5	31·5	113·1	25·3	N.E.	N.	158	1.0	
23	·920	43·7	25·5	35·7	93·4	21·3	N.	N.	47	4·0	·01
24	·674	48·3	29·4	37·6	105·0	24·7	S.	N.	110	3·3	
25	·699	49·8	30·9	40·0	96·2	26·2	W.	N.E.	213	5·0	
26	·605	38 7	34·1	35·5	53·0	32·5	N.E.	E.	139	10·0	·08
27	·382	41·4	32·2	36·6	55·9	31·8	E.	N.E.	125	10·0	·33
28	·209	53·0	38·5	45·4	95·0	38·5	S.	S.	96	9·5	·14
29	·367	51·1	41·3	44·9	100·0	38·6	S.	W.	132	10·0	·20
30	·593	53·0	37·5	45·3	106·0	33·4	S.	S.	151	5·5	·11
31	29·590	59·6	42·4	48·8	114·9	39·3	S.	W.	101	9·0	·08
Mns	29·607	46·6	33·8	39·6	90·5	31·3	...	...	6859	6·8	Sum 4·20

APRIL, 1876.

Days of Month.	Mean Readg. of Barometr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest.	Adopted Mean.	Highst. in sun's rays.	Lowst. on the grass.	Wind. Direction. A.M.	P.M.	Velocity Miles.	Mean amt. of Cloud (0-10)	Rain.
	in.	°	°	°	°	°					in.
1	29·808	52·2	39·7	45·6	90·8	33·3	N.	W.	71	5·0	
2	30·062	58·2	31·5	44·3	107·1	26·7	N.W.	N.	45	0·0	
3	·289	62·7	31.5	47·1	109·3	26·2	N.W.	W.	36	1·0	
4	·479	61·7	42·2	51·3	103·8	34·0	S.W.	W.	89	6 0	
5	·503	57·1	48·9	52·9	73·8	46·6	N.W.	N. W.	97	10 0	
6	·419	58 0	50·1	53·4	74·8	48·6	N.E.	E.	77	9·5	
7	·320	64·0	48·7	53·4	113·3	42·1	E.	E.	161	5·0	
8	30·002	65·9	38·4	51·3	116·0	32·2	S.	S. W.	151	0·0	·04
9	29·854	58·0	45·1	50·7	105·0	40·2	W.	S. W.	218	10·0	·32
10	·456	50·7	36·9	43·3	56·7	35·4	S.	S. W.	343	10·0	·48
11	·765	45·9	30 0	37·2	100·9	25·7	W.	W.	311	0·0	·03
12	·960	45·9	28·7	35·8	106·4	22·2	N.W.	W.	166	7·3	·21
13	.683	37·0	32·0	33·7	63·5	29·4	N.W.	N. W.	2·6	5·0	·13
14	29·981	42·8	31·0	35·6	106·0	28·6	N.	N. E.	265	5·0	·02
15	30·287	54·4	33·6	42·5	103·0	27·3	N.E.	N.	152	2·5	
16	30·083	55·0	30·8	42·6	106·3	19·0	N.	N.	130	0·0	
17	29 534	49·0	38·6	42·7	76·6	31·2	S.E.	S.	68	5·0	·07
18	29·092	54·5	41·7	47·4	106·6	38·8	S.	S.	206	10 0	·27
19	28·985	52·4	43·0	46·6	101·2	38·8	S.E.	W.	150	10 0	·08
20	29·302	51·7	42·0	46 6	92·8	37·0	S.	S. W.	224	10·0	·65
21	·613	57·5	45·4	50·0	104·5	43·7	S. W.	S. W.	141	4·5	·13
22	·925	57·7	40·8	48·6	115·6	30·7	W.	W.	101	2 5	
23	29·992	56·5	36·0	47·1	108·0	27·5	S.	S.	89	9·5	·02
24	30·020	57·0	44·9	50·6	115·2	38·0	S.	W.	191	8·5	·18
25	·146	57·9	44·5	49·3	115·1	37·2	W.	W.	276	5·0	
26	30·178	57·2	39·0	48·8	113·7	31·7	W.	W.	230	6·0	·06
27	29·863	55·4	44·8	49·6	81·7	41·2	S.	W.	65	10·0	·13
28	·524	56·9	44·0	49·2	117·1	40·7	W.	S. W.	224	3·5	·16
29	·541	55·9	42·0	48·8	101·0	39·1	S. E.	S.	122	9·0	·31
30	29·773	48·8	38·6	41·9	58·8	35·5	E.	N. E.	183	9·5	·12
Mns	29·841	54·6	39·5	46·2	98·1	34·3	...	...	Sum 4828	6·0	Sum 3.41

MAY, 1876.

Days of Month.	Mean Readg. of Barometr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest.	Adopted Mean.	Highest in sun's rays.	Lowst on the grass.	Wind. Direction A.M	P M.	Velocity. Miles	Mean amt. of Cloud (0-10)	Rain.
	in.	°	°	°	°	°					in.
1	30·074	50·2	32·1	40·7	106·0	29·5	N.	N.	106	10·0	·09
2	·232	49·0	32·7	40·1	103·3	29·4	N.	N.W.	95	2·5	
3	·377	54·5	30·0	42·8	115·0	27·4	N.E.	E.	46	2·5	
4	·471	59·7	32·0	46·1	114·7	28·6	E.	E.	76	0·0	
5	·342	61·9	32·5	48·5	115·5	29·3	E.	N.E.	82	0·0	
6	·260	65·6	32 9	50·6	114·7	29 4	N.E.	N.E.	62	0·5	
7	·365	58 0	39·3	48·2	114·0	36·0	N.E.	N.E.	155	4·7	
8	·410	58·5	37·9	47·3	115·0	34·2	N.E.	E.	187	3·5	
9	·342	57·0	36·7	45·6	110·9	34·7	N.E.	E.	294	1·5	
10	·251	58·4	36·5	46·9	117·8	33·3	E.	E.	214	3·0	
11	·163	58·4	37·4	47 0	117·9	34·1	N.E.	N.E.	185	2·5	
12	·216	55 9	35·7	45·0	113·4	31·0	N.E.	N.E.	178	2·5	
13	·285	54·9	32·5	43·5	114·6	26·7	N.E.	N.E.	146	3·5	
14	·105	59 4	29·8	47·6	113·2	25·2	N.E.	N.E.	79	6·0	
15	·116	55·0	39·3	46·5	93·2	34·1	N.	N.	118	10·0	·04
16	·187	58·2	36·8	46·6	111·2	33·7	E.	N.E.	179	5·0	
17	·207	47·4	39·2	44·5	116·0	36·4	N.E.	N.E.	218	5·0	
18	·258	55·4	39 8	46·4	113·0	36·4	N.E.	N.E.	207	5·3	
19	·314	63·7	39·3	49·9	122·2	36·8	N.E.	E.	166	4·7	
20	·271	65·4	34·6	50·9	115 7	30 7	N.E.	N.	49	1·5	
21	30·072	69·7	37·9	55·4	117·6	34·7	S.W.	W.	101	5·3	
22	29·803	58·7	45·3	52·4	112·2	42·0	S.W.	W.	98	9·5	·63
23	·794	56·5	45·3	49·8	101·3	42 2	W.	W.	197	5·0	
24	·720	58·1	43·2	49·6	122·8	37·4	S.	N.	70	9·7	·13
25	·880	54·0	44·1	47·6	98·6	42·5	N.	N.W.	93	10·0	·08
26	29·868	56·9	44·4	50·6	79 6	42·4	N.W.	N.	130	10 0	·01
27	30 008	60·1	50·6	54·8	88·7	48·0	N.	N.W.	144	10·0	
28	·242	67·4	43·2	54·1	123 0	40·5	N.	W.	100	5·3	
29	·229	66·6	44·9	55·1	126·0	42·3	W.S.W	W.	78	3·5	
30	·129	65·9	41·3	53·7	118·9	36 7	W.	W.	123	6·5	
31	30·176	62·8	48·7	54 2	109 3	44·0	N.	N.	120	4·5	
Mns.	30·167	58·8	38·5	48·5	111·5	35·1	...	...	Sum 4090	5 0	Sum 0·93

JUNE 1876.

Days of Month.	Mean Readg. of Baromtr, reduced to Sea level.	Temperature. In the Shade. Highest.	Lowest.	Adopted Mean.	Highest insun's rays.	Lowst on the grass.	Wind. Direction. A.M.	P.M.	Velocity Miles.	Mean amt. of Cloud (0-10)	Rain.
											in.
1	30·243	70°0	38°7	55°3	124°0	35°4	N.	N.	27	0·0	
2	30·037	71·4	42·1	57·3	119·3	38·6	N.	S.W.	89	5·0	·24
3	29·809	67·7	47·5	56·7	126·1	45.5	S.W.	W.	167	9·5	·14
4	·976	61·9	43·2	52.6	120·6	38·2	W.	S.W.	154	6.5	·19
5	29·941	62·8	48.7	54·7	82·9	47·1	S.W.	W.	192	9·5	·02
6	30·040	65·5	49·0	56·2	117·8	48·0	N.W.	W.	41	10·0	
7	30·014	62·5	48·0	54·4	121·0	44·4	W.	W.	157	3·5	
8	29·879	60·8	42·5	52·5	109·1	36·4	S.	N.W.	49	9·9	·05
9	29·837	62·9	48·8	54·6	113·9	47·8	N.E.	N.E.	62	9·8	·16
10	30·219	61.0	46·4	51·3	113·7	41·4	N.E.	N.W.	114	4·7	
11	·157	70·5	36·5	56.2	119·3	34·5	N.	N.W.	69	1·0	
12	·073	74·0	46·5	59·8	131·6	45·0	W.	W.	105	6·0	
13	·049	64·0	51·8	57·0	100 7	50·7	W.	W.	29	10·0	·47
14	30·052	65·9	43·7	54·8	121·6	40.5	W.	S.W.	103	3·0	
15	29·835	58·6	47·9	53·2	94·9	45·2	S.	N.	203	10·0	·60
16	.906	61·2	47·0	52·8	117·4	45·7	W.	W.	138	8·0	
17	29·852	59·5	47·2	53·9	87·8	45·2	W.	S.W.	154	8·0	
18	30·094	68·4	48·7	57·4	130·9	45·2	W.	S.	139	2·5	
19	·121	72·9	48·2	59·4	130·9	46·2	S.	E.	103	5·0	
20	30·004	79·9	52·6	67·6	134·8	49·2	E.	S.E.	133	2·0	
21	29·905	82·7	55·6	68·0	132·0	51·9	E.	N.W.	161	4·6	
22	30.024	69·7	53·1	60·5	117·8	52·8	N.	N.	70	9·5	·11
23	29·978	70·9	53·7	60·6	123·5	52·6	N.	N.	38	7·5	
24	·926	69·0	53·0	59·7	126·5	49·6	N.E.	N.E.	60	5·0	
25	29·988	71·5	48·9	60·6	124·0	45·9	N.E.	N.E.	256	0·5	
26	30·048	74·3	50·4	63·3	123·5	45·0	N.E.	N.	117	0·0	
27	·195	77·7	49·7	63·2	127·7	45·2	N.	N.	52	0·0	
28	·117	81·2	48·9	66·0	126·3	45·7	W.	N.E.	29	0·8	
29	30·023	68·7	49·8	58·4	125·3	46·8	N.	N.	90	0·7	
30	29·997	71·7	47·2	59·6	131·1	42·6	N.W.	N.W.	97	8·0	
Mns.	30·011	68·6	47·8	57·9	119·2	44·9	...	...	3198	5·4	Sum 1·98

JULY, 1876.

Days of Month.	Mean Readg. of Baromtr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest.	Adopted. Mean.	Highst insun's rays	Lowst. on the grass.	Wind. Direction. A.M.	P.M.	Velocity Miles.	Mean amt. of Cloud (0-10)	Rain.
	in.	°	°	°	°	°					in.
1	29·984	70·8	57·8	62·2	108·9	54·7	W.	W.	153	9·0	
2	30·083	75·7	56·6	64·0	136·3	55 0	N.W.	W N W	95	9·5	
3	·129	72·7	58·8	65·1	112·7	58·0	S.E.	S.W.	133	7·0	
4	30·061	69·2	56·0	63·3	97·8	51·2	S. W.	S.	113	10·0	
5	29·978	69·7	59·5	62·7	122·3	58·8	S. W.	S.W.	151	7·5	·02
6	·975	69·6	49 9	61·2	121·0	45·8	N.W.	S.	66	7·0	·26
7	·808	72·9	58·0	63·2	129·2	57·7	W.	S.	161	6·5	·01
8	29·843	69·6	58·1	63·0	119·4	55·0	S.W.	W.	144	5·0	·18
9	30·024	70·9	54·1	61·2	128·0	50·4	N.W.	W.	149	6·0	•
10	·103	66·0	49·1	56 9	125·6	46·4	N.W.	W.	167	9·5	
11	·337	64·3	50·0	58·3	125·1	45·9	W.	S.W.	59	9·0	
12	·449	72·5	49·2	61·0	127·3	45·2	S.	W.	86	0·0	
13	.412	82·7	49·7	67·9	130·6	43·7	N.	N.W.	34	0·1	
14	·412	88·4	53·5	78·3	136·4	47·5	S.	S.	25	0·0	
15	·392	90·7	57·4	75·2	136·0	53·5	S.E.	E.	25	0·5	
16	·321	89·7	60·3	75·6	136·0	56·1	E.	S.	44	2·0	
17	·252	87·8	59·6	74·2	143·0	54·1	S. W.	W.	66	4·0	
18	·224	80·7	55·8	68·2	129·7	54·2	N.W.	N.W.	47	7·0	
19	·177	80·3	54 7	67·6	132·8	50·0	N.W.	N.W.	138	3·0	
20	·231	80·7	53·9	67·8	129·3	48·6	N.	E.N.E.	51	0 5	
21	·149	84·7	52·6	70·3	135·7	49·6	W.	S.W.	61	2·0	
22	30·006	86·5	58·4	72·8	133·0	55·4	S.W.	S.	19	5·5	
23	29·983	74·2	57·8	64·1	128·8	52·0	N.E.	N.E.	107	4 5	
24	30·120	73 7	50·7	62·5	120·3	45 0	N.E.	N.W.	149	5·0	
25	·202	79·9	52·5	65·5	133·0	45·6	N.E.	W N W	90	2·0	
26	·042	78·8	54·0	65·2	130·3	48·1	S.W.	N.W.	143	4·5	·01
27	30·054	71·8	54·1	61·9	125·0	51·0	N.	N.	95	4·5	
28	29 732	67·6	54·8	59·2	108 0	49·9	S.W.	N.	155	5·0	·08
29	30·017	69·7	48·8	58·2	126 0	43·7	N.W.	W.	173	10·0	
30	29·981	71·9	55·7	62·7	126·4	52·0	S.W.	W.	171	9·5	·01
31	29·752	68·5	51·5	58·3	119·9	47·9	S.	N.W.	139	7·0	·31
Mns	30·104	75·9	54·6	64·9	126·3	50 7	...	...	Sum 3209	5·2	Sum 0·88

AUGUST, 1876.

Days of Month.	Mean Readg. of Barometr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest.	Adopted Mean.	Highest in sun's rays.	Lowst. on the grass.	Wind. Direction. A.M.	P.M.	Velocity Miles	Mean amt. of Cloud (0-10)	Rain.
	in.	°	°	°	°	°					in.
1	30·087	64·7	45·7	54·4	119.0	41·1	S.W.	N.W.	193	4·7	·07
2	29·955	69 7	48 0	60·0	127·7	41·2	S.W.	S.	169	7·5	·53
3	29·658	66·7	53·8	60·2	119·2	52·7	S.W.	W.	283	7·5	
4	30·009	64.9	52·3	58·4	105.8	47·1	S.W.	S.	156	10·0	·76
5	·229	70·7	52·8	60·7	123·9	49·3	S.W.	N.	139	0·3	
6	·295	72·6	48·7	60·7	122·1	42·3	W.	W.	89	10 0	
7	·204	78·0	58·8	65.3	125·2	56·1	W.	N.W.	141	3·5	
8	·182	79·8	54·8	64·0	128·2	49·2	W.	N.	63	5·0	
9	·108	84·0	49·2	67·4	132·3	43 9	S.W.	W.	62	1·0	
10	·324	73·7	53·6	62·4	124·3	47·9	N.E.	N.	66	4·5	
11	·327	77·7	45·1	62·5	124·8	39·4	S.W·	E.	46	0·5	
12	30·140	80·7	49·9	65·2	131·7	43·0	N.E.	E.	93	0·0	
13	29·949	92·0	53·8	72·7	136·6	47·6	E.	S.	55	0 0	
14	950	85·3	56·8	70·4	131·7	52·6	W.	W.	62	0·0	
15	·999	84·7	56·6	70 7	133·5	51·3	W.	W.	37	0·0	
16	·978	86·7	57·7	72.3	137·8	53·4	E.	N.W.	55	2·5	
17	·883	84·7	56·8	70·9	128·3	53·8	N.E.	N.E.	167	5 5	·07
18	·984	74·7	61·9	66·0	115 8	57·8	S.	N.E.	85	10·0	·13
19	·858	70·7	59·5	65·8	100·3	56 0	N.E.	N.E.	65	9·5	·77
20	·775	72·5	59·6	64·4	127·4	59·2	N.E.	S.	111	9·0	·94
21	·896	77·0	56·1	65·5	135·3	53·8	E.	W.	76	2·0	
22	·903	73·9	58·0	63·6	126·8	55·0	W.	W.	88	7·0	
23	·871	66·7	48·0	56·3	121·3	46·1	N.	N.	79	0·5	
24	29·880	65·9	45·5	54·9	123·0	42·3	N.	N.W.	110	4·5	
25	30·044	61·7	39·8	50·6	114·3	37·0	N.	N.	90	2·0	
26	29·925	63·2	44·0	54·3	119 0	39·2	W.	S.	120	9·0	·04
27	·853	64·0	51·3	55·8	115·0	48·1	W.	N.W.	184	4·5	
28	·947	67·1	46·8	57·7	92·6	40 8	S.W.	N.W.	113	10·0	·33
29	·786	65·4	52·5	57 7	121 3	50·0	N.W.	W.	116	5·0	·07
30	·543	65·4	51·6	57·8	121·2	48 3	S.W.	S.W.	213	7·5	·64
31	29 302	55·8	44·1	51·3	105·3	41·5	S.W.	S.W.	249	8·0	·40
Mns	29·963	72·9	52·0	61·9	122·3	48 0	...	...	Sum 3575	4·9	Sum 4·75

SEPTEMBER, 1876.

Days of Month.	Mean Readg. of Barometr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest.	Adopted Mean.	Highst insun's rays.	Lowst. on the grass.	Wind. Direction. A.M.	P.M.	Velocity Miles.	Mean amt. of Cloud (0-10)	Rain.
	in.	°	°	°	°	°					in.
1	29·728	65·7	50·2	55·7	117·8	47·8	N.W.	W.	198	4·0	
2	·876	66·7	48·9	56·3	120·7	41·4	N.	N.W.	63	8·0	·08
3	·973	65·8	48·9	57·4	119·8	43·3	N.	S.	60	7·5	·42
4	·647	68·6	53·8	61·5	120·0	52·0	S. W.	W.	178	10·0	·78
5	·679	69·3	56·6	61·7	125·3	52·0	S. W.	W.	223	7·0	1·64
6	·637	65·3	55·9	59·5	117·8	53·8	W.	S.W.	223	7·5	·35
7	·618	64·6	52·1	56·7	116·0	50·0	N.W.	W.	175	7·5	·11
8	·775	62·0	44·0	51·9	117·4	39·7	N.W.	W.	116	2·5	·04
9	·811	61·2	43·7	52·3	114·0	39·2	W.	W.	155	7·0	·11
10	·830	61·4	45·6	53·2	109·8	39·9	W.	W.	100	5·0	·15
11	·869	59·0	44·1	51·3	112·0	39·9	W.	W.	114	8·0	·02
12	·919	58·5	46·5	50·9	109·1	45·2	N.	N.	87	10·0	
13	.838	56·4	44·2	50·4	89·5	39·3	W.	N.W.	81	10·0	·01
14	·823	58·7	46·8	51·8	97·3	43·2	N.	N.	29	9·5	·03
15	·766	62·8	40·8	51·5	112·9	37·8	S.	N.	61	5·5	·42
16	·652	58·4	45·0	52·2	67·5	43·2	S.E.	N.W.	108	10·0	·12
17	·812	64·9	48·3	55·3	117·8	43·5	N.W.	N.W.	116	4·0	
18	29·967	66·0	48·6	57·4	120·0	44·2	W.	W.	150	8·0	·01
19	30·302	65·0	45·7	54·7	116·9	40·2	W.	W.	62	3·0	
20	·388	71·5	41·5	56·9	120·8	37·5	N.	W.	29	2·0	
21	30·202	71·2	45·2	57·2	119·9	41·1	S.	S.	52	4·5	
22	29·960	70·0	47·3	59·5	117·6	43·1	E.	N.	94	5·5	·05
23	·838	69·3	55·7	60·7	120·0	55·5	S.W.	W.	96	10 0	·64
24	·660	63·7	55·3	58·5	98·2	53·0	S.	W.	521	10·0	·11
25	·923	64·5	53·3	57·7	113·2	49·5	W.	W.	455	7·0	·05
26	·667	61·8	52·7	57·4	75·8	49·8	S.E.	E.	128	10·0	·05
27	·661	58·7	53·1	55·3	66·6	53·0	N.E.	N.	85	10·0	·48
28	·364	62·8	54·3	57·0	107·2	50·6	S. W.	S.W.	113	10·0	·20
29	·709	64·3	46·0	53·6	112·0	41·2	W.	W.	88	1·0	·16
30	29·400	56·8	47·2	52·8	68·8	43·2	S.E.	S.E.	148	10·0	·90
Mns	29·811	63·8	48·7	55·6	108·1	45·1	...	...	Sum 4111	7·1	Sum 6·88

OCTOBER, 1876.

Days of Month.	Mean Readg. of Barom tr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest.	Adopted Mean.	Highst insun's rays.	Lowst on the grass.	Wind. Direction. A.M.	P.M.	Velocity. Miles.	Mean amt. of Cloud (0-10)	Rain.
	in.	°	°	°	°	°					in.
1	29·980	57·0	48·5	51·0	104·0	42·9	N.E.	N.E.	214	10·0	
2	30·099	54·6	45·5	50·0	70·3	46 1	E.	E.	171	7·0	·01
3	29 865	66·6	49 4	57·3	108·1	47·2	S.E.	S.	129	9·0	·12
4	·817	64·3	54·5	58·3	108 8	49·1	S.E.	S.W.	121	9·0	·04
5	·918	68·4	54·3	60·1	120·2	49·5	S.W.	N.	145	7·0	·02
6	·877	67·7	58·4	61·3	114·8	52·0	S.	S.W.	100	10·0	·47
7	·942	70·3	57·3	62·1	117·7	51·8	W.	W.	76	8·0	
8	·844	65·4	55·4	60·2	100·0	49·5	S.	S.	81	9·0	·14
9	·550	63·0	55·2	58·5	109·1	54·3	S.W.	S.W.	247	10·0	·44
10	·512	63·0	52 6	56·0	101·3	47·2	S.W.	S.W.	166	6 5	·10
11	·310	59·3	50 4	54 4	89·8	45·0	S.W.	S.W.	242	7·0	·04
12	·647	61·9	46·6	54·0	110·7	39·2	S.W.	N.	151	5·3	·20
13	·635	61·5	47·5	53·5	96·9	38·9	S.W.	S.W.	121	5·0	·02
14	·784	60·2	42·3	49·3	102·0	36·4	S.W.	W.	105	5·0	·02
15	·909	61·5	41·2	50·5	110·7	32·3	S.W.	S.W.	99	0·5	
16	·678	60·5	45·0	53·6	109·3	36·2	S.	S.W.	144	7·5	
17	·650	67·9	52·4	57·9	110·8	44·7	N.E.	N.E.	153	9·0	·01
18	·653	61·2	53·3	56·9	71·5	46·1	N.E.	N.E.	99	10 0	
19	29 838	67·8	52·8	57·2	102·5	46·1	N.E.	N.E.	106	5.0	
20	30·058	55·7	50·0	52·2	68 0	48 5	N.E.	N.E.	173	10 0	
21	·130	52·6	42·2	45·5	104·3	39·5	N.E.	N.E.	191	5·0	
22	·123	48·6	41·7	44 7	80·5	35·9	N.E.	E.	193	10·0	
23	·128	46·2	42·9	44·2	53·7	42·1	N.E.	N.E.	113	10·0	·04
24	·217	49·6	40·6	44·5	58·9	33·8	N.E.	N.E.	21	10·0	
25	·336	57·8	36·6	45·6	98·0	35·2	N.E.	N.E.	21	9·0	
26	·325	49·6	35·6	43·5	51·4	32·2	N.E.	N.E.	36	10·0	
27	·275	53·6	45·6	47·7	98·0	45·2	N.E.	E.	64	10 0	
28	·313	48·9	44·3	46·1	55 0	42·0	N.E.	N.E.	32	10·0	
29	·292	57·4	37·8	44·9	98·3	31·6	N.W.	W.	25	2·0	
30	·253	57·2	35·4	46·3	101·0	29 0	N.W.	N.W.	110	9·0	
31	30 293	45·7	32·0	37·4	85·4	24·4	N.W.	N.W.	89	0·0	
Mns.	29·943	58·9	46·7	51·8	93·9	41·7	...	...	Sum 3738	7·6	Sum 1·67

NOVEMBER, 1876.

Days of Month.	Mean Readg. of Baromtr, reduced to Sea level.	Temperature. In the Shade. Highest.	Lowest.	Adopted Mean.	Highst insun's rays.	Lowst. on the grass.	Wind. Direction. A.M.	P.M.	Velocity. Miles.	Mean amt. of Cloud (0-10)	Rain.
		°	°	°	°	°					in.
1	30·396	46·6	27·5	35·3	85·6	21·6	N.W.	N.W.	75	0·0	
2	·380	51·7	25·7	37·9	92·3	20·0	N.W.	N.W.	66	8·5	
3	·255	52·0	33·6	44·5	67·3	26·2	S.W.	S.W.	66	10·0	·10
4	·341	52·5	44·9	48·8	60·4	36·4	N.W.	N.	52	10·0	
5	·307	58·5	45·5	50·3	100·3	40·5	N.W.	N.W.	61	10·0	·02
6	·278	50·0	39·8	44·6	54·1	31·2	N.W.	N.W.	61	8·5	
7	·249	46·0	31·8	36·7	86·6	25·0	N.	N.W.	49	0·0	
8	·102	42·9	26·7	32·4	84·7	17·2	N.E.	N.E.	51	3·0	
9	·057	38·3	26·6	31·4	72·2	20·1	N.	N.	64	5·0	
10	30·203	37·5	25·9	31·0	64·3	16·3	N.	S.E.	52	6·0	
11	29·786	40·9	26·0	34·1	86·7	20·2	S.E.	S.E.	187	8·0	·33
12	·196	44·2	32·1	39·0	43·8	32·0	N.E.	N.E.	259	10·0	·71
13	·553	44·9	39·7	42·3	51·0	39·9	N.W.	W.	120	10·0	·29
14	·529	60·8	44·1	52·4	101·0	44·1	S.E.	S.	118	7·5	·12
15	·532	57·8	49·2	52·0	96·1	40·4	S.W.	S.W.	47	9·5	·45
16	·380	57·8	49·2	53·5	72·8	48·2	S.	S.W.	257	10·0	
17	·925	56·4	46·4	49·7	99·3	38·6	S.W.	S.W.	121	8·0	·08
18	·931	55·1	47·7	52·2	56·9	40·5	S.	S.W.	185	10·0	·24
19	·797	55·3	43·9	48·2	85·0	57·2	S.W.	W.	161	7·0	
20	29·881	51·2	37·5	42·8	85·5	31·4	W.	N.W.	177	3·0	·01
21	30·144	46·8	37·4	42·6	66·2	31·4	N.W.	N.W.	52	5·0	
22	·257	46·3	34·7	38·6	86·0	30 6	E.	N.E.	68	4·7	
23	30·090	41·0	34·8	38·6	44·5	33·5	E.	S.E.	153	10 0	
24	29 868	43·4	38·6	40·7	75·0	33·2	S.E.	N.	128	10·0	·46
25	·474	52·8	39·8	45·7	93·8	35·7	S.E.	W.	199	5·5	·13
26	·608	51·9	37·3	43·9	90·0	29·2	S.	S.	141	7·5	·22
27	·294	49·0	43·2	45·3	57·4	37 9	S.	W.	112	9·0	·80
28	·516	47·6	34·9	40·3	88·3	31·2	S.W.	S.W.	490	5·5	·07
29	·618	47·8	34·2	39·1	88 8	27·9	W.	W.	306	1·5	·01
30	29·608	45·6	31·7	39·7	46.2	22 1	N.	W.	41	10·0	·30
Mns	29·885	49·1	37·0	42·5	76·1	31·3	...	...	Sum 3917	6·9	Sum 4·34

DECEMBER, 1876.

Days of Month.	Mean Readg. of Baromtr. reduced to Sea Level.	Temperature. In the Shade. Highest.	Lowest.	Adopted Mean.	Highst insun's rays.	Lowst. on the grass.	Wind. Direction. A.M.	P.M.	Velocity Miles	Mean amt. of Cloud (0-10)	Rain.
	in.	°	°	°	°	°					in.
1	29·300	53·7	44·1	49·3	78.8	42·4	S.W.	S.	259	6·0	·38
2	29·236	54·5	48·6	51·6	59·1	42·2	S.	S.	200	10·0	·42
3	28·911	55·5	48·5	51·1	84·3	43·8	S.	S.	362	9·5	·66
4	·552	50.6	45·0	47·7	58.5	42·2	S.W.	S.W.	736	9·5	·13
5	28·769	51·5	45·3	48·2	54·2	39·5	S.	S.W.	233	6·5	.43
6	29·161	51·1	43·6	45·9	74·8	38·2	S.W.	S.W.	221	2·5	·28
7	·148	47·0	44·2	45.7	48·2	38·2	N.E.	E.	161	10 0	·91
8	29·794	48·8	38·6	42·6	79·2	33·5	N.W.	N.W.	142	5·0	
9	30·195	49·9	32·6	39·6	84·0	25·4	W.	W.	62	7·5	
10	·193	45·5	40·3	42·2	50·0	36·2	W.	W.	34	9·5	
11	30·057	46·1	40·7	42·8	50 9	38·0	E.	S.W.	79	10·0	·03
12	29·701	48·7	39·5	43·5	51·7	35·2	S.	W.	401	5·0	·31
13	·808	45·7	30·7	38·1	79·3	28·3	S.	S.E.	371	1·5	
14	·901	44·8	40·6	42·0	48·3	33·4	S.E.	N.E.	123	9·5	
15	·847	45·3	39·7	42·3	44·1	38·7	E.	E.	144	10·0	·15
16	·743	47·4	40·1	44.2	52·5	38·4	S.E.	E.	145	10·0	·07
17	·613	46·0	41·9	43·4	49·8	42·2	S.E.	E.	149	10·0	·34
18	29·271	43·2	39·2	40·7	48·5	40·8	E.	N.	112	10·0	
19	28·994	45·0	38·5	41·7	70·4	39·7	E.	E.	93	10·0	·58
20	·690	45·8	38·2	40·8	65·0	36·4	S.	E.	155	9·3	·19
21	28·893	45·8	32·5	37·7	82·2	28·2	W.	W.	129	5·0	
22	29·244	38·7	29·9	33·2	54·3	25·2	W.	W.	75	1·7	·27
23	·415	36·3	28·6	32·1	38·2	24·5	N.E.	N.E.	30	10·0	
24	·571	34·0	30·6	32·4	43·3	32·1	N.E.	N.E.	50	10·0	·05
25	29·909	34·0	30·5	32·3	37·0	28·5	N.E.	N.E.	172	9·5	
26	30·064	35·1	29·8	32·3	38·2	29·0	S.E.	S.	177	10·0	·48
27	29·694	54·5	33·5	47·1	53·7	32·1	S.	W.	812	10·0	·3
28	·702	54·8	43·7	51·7	56·8	44·5	W.	W.	744	10·0	·30
29	·607	52·2	45·3	49·2	57·4	40·2	S.	W.	249	10·0	·35
30	·482	52·4	43·4	48·5	53·3	39·4	S.	S.	748	9·5	·31
31	29·210	53·6	43·0	50·5	69·4	43·6	S.	S.	834	10·0	·21
Mns.	29·478	47·0	39·4	42·9	58·6	36·1	...	...	Sum 8242	8·3	Sum 7·20

1876.

SUMMARY.

Month.	Mean Reading of the Barometer (reduced to Sea Level.)	Temperature. In the Shade. Highest.	Lowest.	Mean of all the Highest.	Mean of all the Lowest.	Adopted Mean.	Dew Point.	Mean of all the Highest in the sun's rays.	Mean of all the Lowest on the grass.	Degree of Humidity (Saturation = 100)	Wind. Direction. Proportion of N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Velocity.	Amount of Cloud.	Rain. No. of days it fell.	Amount collected.
	in.	°	°	°	°	°	°	°	°										Miles.			in.
January	30·290	53·3	19·9	42·0	31·1	36·2	34·6	57·5	29·0	99	3	2	6	4	6	3	4	3	3793	7·9	11	2·51
February.....	29·828	56·0	20·3	46·0	36·3	40·3	36·9	76·2	34·2	94	3	3	3	0	3	7	8	2	5313	7·6	20	3·11
March	29·607	59·6	24·7	46·6	33·8	39·6	35·3	90·5	31·3	88	5	2	1	1	5	2	12	3	6859	6·8	20	4·20
April	29·881	65·9	28·7	54·6	39·5	46·2	41·4	98·1	34·3	88	3	2	2	2	5	4	9	3	4828	6·0	19	3·41
May	30·167	69·7	29·8	58·8	38·5	48·5	41·6	111·5	35·1	79	7	11	5	0	1	1	4	2	4090	5·0	6	0·98
June.....	30·011	82·7	36·5	68·6	47·8	57·9	50·4	119·2	44·9	77	7	5	1	1	2	3	8	3	3198	5·4	9	1·98
July	30·104	90·7	48·8	75·9	54·6	64·9	57·5	126·3	50·7	78	3	2	1	1	5	6	6	7	3209	5·2	8	0·88
August.....	29·963	92·0	39·8	72·9	52·0	61·9	55·7	122·3	48·0	81	4	4	3	0	3	6	8	3	3575	4·9	12	4·75
September ...	29·811	71·5	40·8	63·8	48·7	55·6	52·4	108·1	45·1	92	5	1	1	2	2	3	12	4	4111	7·1	24	6·88
October	29·943	70·3	32·0	58·9	46·7	51·8	48·5	93·9	41·7	92	1	14	2	1	2	8	2	1	3738	7·6	14	1·67
November ...	29·885	60·8	25·9	49·1	37·0	42·5	39·8	76·1	31·3	92	4	2	1	4	3	5	4	7	3917	6·9	17	4·34
December ...	29·473	55·5	28.6	47·0	39·4	42·9	40·9	58·6	36·1	94	1	4	5	2	8	4	6	1	8242	8·3	22	7·20
Year	29·910	92·0	19·9	57·0	42·1	49·0	44·6	94·9	38·5	87·8	46	52	31	18	45	52	83	39	54873	6·6	182	41·91

SUMMARY OF THE WEATHER FOR 1876.

JANUARY.

"At New Year's tide
The days lengthen a cock's stride."

The mild weather which prevailed during the latter part of December lasted till the 4th, the mean temperature for the first four days being 42°7. On the 5th a cold period set in and continued till the 16th, the temperature being 29°7, or more than 2° below the freezing point and the direction of the wind N.E. The wind having changed by the 17th to W, the weather became much milder and continued so till February 3rd, the mean temperature for these 18 days being 39°9. The maximum temperature was 53°3 on the 3rd, the minimum 19°9 on the 9th, and the mean 36°2.

Atmospheric pressure was very high throughout the month, on five occasions only was it below 30·0 inches; the highest observed reading was 30·671 in. at 9 p.m. on the 15th, the lowest 29·636 in. at 9 a.m. on the 21st; and the mean 30·290 in. Snow fell on the 7th, 8th, 11th, and 12th. The total rainfall was 2·51 in. of which 1·51 in. fell on the 21st. Dense fog prevailed from the 25th to the 30th. A Lunar Halo was observed on the 31st.

FEBRUARY.

"If February give much snow
A fine summer it doth foreshow."

The weather from the 4th to the 13th was cold with the wind from N-NE, and occasional snow, the mean temperature being 32°1, or *just above* freezing. On the 4th the wind having changed to S.W., the weather became much milder and continued so till March 8th; the mean temperature for this period was 45°0, and rain fell almost every day. The maximum was 56°0 on the 29th, the minimum 20°3 on the 12th, and the mean for the month 40°3.

The high atmospheric pressure which had prevailed during January gave way on the 4th, and was below the average for the remainder of the month, the mean being 29·828 in. The rainfall was 3·11 in. and the number of rainy days 20. Snow fell on 7 days and hail on 1. Dense fog occurred on the 11th and 12.

MARCH.

"Upon St. David's day
Put oats and barley in the clay."

The first eight days were mild, but from the 9th to the 27th the weather was cold and boisterous with occasional snow, the mean temperature for this period being 36°3. Severe storms occurred on the 9th and 12th. From 9 a.m. on the 8th to 9 a.m. on the 9th the barometer fell 0.846 in., and from 9 a.m. on the 12th to 9 a.m. on the 13th the rise was 1·026 in. The storm on the 12th was remarkable for the sudden fall and rise of the barometer and the rapidity of its progress across the country, it having travelled from the

West of England to London at the rate of 25 miles an hour.

London	to Utrecht	,,	38	,,
Utrecht	to Emden	,,	69	,,
Emden	to Hamburg	,,	77	,,

Atmospheric pressure was variable and the mean for the month, 29·607 in., considerably below the average. The maximum temperature was 59°6 on the 31st, the minimum 24°7 on the 20th, and the mean 39°6. Rain or snow fell on 20 days, amounting to 4·20 ins.; and hail on the 4th, 12th, and 30th. A Lunar Halo was observed on the 7th.

APRIL.

"April weather.
Rain and sunshine, both together.

From March 28th to April 9th the weather was warm, the mean temperature being 48°6, but on the 10th a cold period, with heavy snow, set in and continued till the 17th, the temperature being 39°2. During this interval very heavy snow storms occurred all over the country. From the 18th to the 29th the wind was S.—W. and the weather mild, 48°6.

Atmospheric pressure from the 2nd to the 8th was high, but during the rest of the month was variable; the lowest observed reading was 28·871 in. at 9 am. on the 19th, and the mean for the month 29·881 in. The maximum temperature was 65°9 on the 8th, the minimum 28°7 on the 12th, and the mean 46·2. Rain or snow fell on 19 days (between the 8th and 30th) amounting to 3·41 in. A Thunderstorm with hail occurred on the 28th.

MAY.

"When the wind is in the East,
It is neither good for man nor beast."

This month was for the most part cold and dry,—the mean temperature from April 30th to May 26th was 47°1, and from the 27th to the 31st 54°4. The general direction of the wind was N.—E.

Atmospheric pressure was uniform, and (with the exception of the 22nd to the 27th) was above 30·0 in.; the mean for the month was 30·167 in., Rain fell on 6 days to the amount of 0.98 in. of which 0.63 in. was due to a thunderstorm on the 22nd. Hail fell on the 15th.

The highest temperature was 69°7 on the 21st, the lowest 29°8 on the 14th and the mean 48°5. The thermometer on the grass fell below 32° on 10 occasions.

JUNE.

"June, if sunny,
Brings harvests early."

The first part of this month was cold, but from the 19th the weather was warm; the mean temperature from the 1st to the 18th being 55°0, and from the 19th to the 30th 62°2. The highest temperatures recorded were 82°7 on the 21st and 81°2 on the 28th, and the lowest 36°5 on the 11th and 38°7 on the 1st; the mean for the month was 57°9.

Atmospheric pressure was above the average, the mean being 30·011 in. Rain fell on 9 days amounting to 1·98 in.

Fog occurred on the 12th and 24th.

JULY.

July God send thee calm and fayre,
That happy harvest we may see,
With quyet tyme and healthsome ayre,
And man to God may thankful bee."

The warm weather which set in about June 19th continued till July 27th; the mean temperature for this period of 39 days being 64°6. From the 13th to the 22nd the weather was especially hot, the maximum on each day being above 80°. On the 15th the temperature rose to 90°7, which is the highest reading that has been recorded since the observations were started in 1865. The following are the maximum temperatures that have been registered in July, for the last twelve years:—

1865.	82°1.	1869.	87°8.	1873.	88°2.
1866.	83·2.	1870.	86·9.	1874.	86·6.
1867.	77·6.	1871.	77·7.	1875.	76·7.
1868.	89·8.	1872.	83·3.	1876.	90·7.

Atmospheric pressure was uniformly high, the mean being 30·104 in. No rain fell from June 23rd to July 4th, or from the 9th to the 25th; the rainfall for the month was 0·88 in., which fell on eight days. A slight thunder-storm occurred on the 16th. The highest temperature was 90°7, on the 15th; the lowest 48°8, on the 29th; and the mean 64°9.

AUGUST.

"Dry August and warm,
Doth harvest no harm."

With the exception of the first four or five days the weather was very hot till the 22nd, when a cold period set in, which continued throughout the remainder of the month. The mean temperature for the 18 days, 5th to the 22nd, was 66°1. On the 13th the highest temperature ever recorded here was registered, viz.: 92°0.

The following are the highest readings in each year since 1865, and the dates on which they occurred :—

1865.	88°7	June 21.	1871.	85°3	August 13.
1866.	83·2	July 12.	1872.	83·3	July 21.
1867.	83·1	August 13.	1873.	88·2	July 22.
1868.	89·8	July 22.	1874.	86·6	July 19.
1869.	87·8	July 22.	1875.	81·9	August 16.
1870.	86·9	July 22.	1876.	92·0	August 13.

The minimum temperature was 39°8, on the 25th, and the mean for the month 61°9.

Atmospheric pressure was on the whole very uniform, the mean 29·963 in. being nearly the average. Heavy falls of rain occurred on five days, viz.: on the 2nd, 0·53 in.; 4th, 0·76 in.; 19th, 0·77 in.; 20th, 0·94 in.; and 31st, 0·40 in. The number of rainy days was twelve, and the total amount collected 4·75 in. A thunder-storm occurred on the 19th, and lightning was seen on the 17th.

SEPTEMBER.

"August bears the burden, September the fruit."

The cold weather which set in on August 23rd, continued more or less throughout the whole of September; the mean temperature of the month was 55°6, which is 6°3 lower than that of August.

This month was remarkable for its heavy rainfall. Rain fell on no less than twenty-four days, to the amount of 6·88 in., which is the greatest fall for September since 1866.

The following is the rainfall for September from 1865 :—

	in.		in.		in.
1865.	0·28.	1869.	5·72.	1873.	2·96.
1866.	6·97.	1870.	1·29.	1874.	4·65.
1867.	2·28.	1871.	6·22.	1875.	3·78.
1868.	5·05.	1872.	1·09.	1876.	6·88.

Lightning was seen on the 14th, and thunder heard on the 22nd. Atmospheric pressure, with the exception of the 19th to 21st, was below the average, the mean for the month being 29·811 in. The maximum temperature 71°5 occurred on the 20th, and the minimum 40°8 on the 15th.

OCTOBER.

"A good October and a good blast,
To blow the hog acorn and mast."

The first part of this month was mild and wet, and the latter part dry and cool; the mean temperature from the 3rd to the 20th was 56°3, and from the 21st to the 31st, 44·6. Rain fell daily from the 2nd to the 14th, with the exception of the 7th, the only other rainy days being the 17th and 23rd; the total fall during the month was 1·67 in. A thunderstorm occurred on the 6th. The general direction of the wind was S.W. till the 16th, but from the 17th to the 28th it blew persistently from the N.E.

Atmospheric pressure was low till the 19th, but high from the 20th to the 31st; the mean for the month was 29·943 in. The maximum temperature was 70°3 on the 7th, the minimum 32°0 on the 31st, and the mean 51°8.

NOVEMBER.

If there's ice in November that will bear a duck,
There'll be nothing after but sludge and muck."

The weather during this month was alternately cold and mild:—1st and 2nd, cold, mean temperature 36°6; 3rd to 6th, mild, 47°1; 7th to 12th, cold, 34°1; 13th to 21st, mild, 48°4; 22nd and 23rd, cold, 38°6; and 24th to 30th, mild, 42°1. On the 14th the temperature rose to 60°8, which is extremely high for November, and is the highest recorded in that month since the observations were started in 1865. The following are the highest readings in each November for the last 12 years:—

1865.	57°2.	1869.	57°7.	1873.	57°3.
1866.	57·9.	1870.	53·8.	1874.	56·7.
1867.	58·4.	1871.	51·9.	1875.	59·4.
1868.	56·1.	1872.	60·5.	1876.	60·8.

The lowest temperature was 25°9 on the 10th, and the mean for the month 42°5.

Atmospheric pressure from the 1st to the 10th was high, but from the 11th was subject to considerable variations: the mean was 29·885 in. Rain fell on 17 days, including a little snow on the 9th and 12th, the total amount measured being 4·34 in.

DECEMBER.

"Summer in winter and summer's flood,
Never boded an Englishman good."

This month will long be remembered for its excessive rainfall, which caused disastrous floods all over the country, heavy gales, and low barometer readings. The total rainfall was 7·20 in., which is the largest amount that has been measured in any December since the commencement of the observations, as will be seen from the following :—

	in.		in.		in.
1865.	2·39.	1869.	3·69.	1873.	0·88.
1866.	3·24.	1870.	2·51.	1874.	2·78.
1867.	1·58.	1871.	2.49.	1875.	1·31.
1868.	5·71.	1872.	5.52.	1876.	7·20.

The weather till the 21st was mild, the mean temperature being 43°9; the next five days were cold 32°5, with the wind from the N.E.; and the last five days of the year were very mild and wet, the temperature being as high as 49°4. The maximum temperature was 55°5 on the 3rd, the minimum 28°6 on the 23rd, and the mean 42°9, which is above that of November.

Atmospheric pressure was subject to great variations, on the 4th it fell to the remarkably low point of 28·242 in. at 8.30 a.m., and on the 20th at 9 p.m. was as low as 28·628 in. The mean for the month was only 29·473 in., which is nearly half an inch below the average. Snow fell on the 23rd and 26th; a Lunar Halo was observed on the 28th.

FLORA

OF

MARLBOROUGH,

BY THE

REV. T. A. PRESTON.

Second Edition—Part IV.

CHRISTMAS, 1876.

FLORA OF MARLBOROUGH.

PART IV.

IV. MONOCHLAMYDEÆ.

The plants of this division are roughly distinguished by the absence of one or both of the floral whorls, viz., the calyx or corolla, but after a short experience it will be noticed that there is a certain character about the plants, properly belonging to this Division, which distinguishes them from those of the other Divisions, to which the above characteristic also applies; for in each of the Divisions there are some species wanting either the calyx or corolla.

In Division I. (*Thalamiflorœ*) *Clematis, Anemone, Thalictrum, Caltha*, which are all readily distinguished by their numerous stamens.

In Division II. *Alchemilla, Sanguisorba, Poterium, Sajina, Chrysosplenium*, by their numerous stamens attached to the calyx, or by their stipules, divided leaves and ovary.

In Division III. *Fraxinus* by its pinnate leaves and ovary.

In most of these cases the plants form very small genera and are placed in the different divisions according to their affinities to larger genera.

The following table will be probably found applicable to all species found near Marlborough.

Flowers perfect.

Trees ... ... 62. Ulmaceæ.

Shrubs ... ... 56. Thymelaceæ.

Herbs.

Stipules sheathing ... ... 55. Polygonaceæ.

Stipules wanting.

Leaves flat, broad ... ... 54. Chenopodiaceæ.

Leaves very slender ... ... 57. Santalaceæ.

Flowers monœcious.

Trees or shrubs.

Male flowers in catkins, leaves deciduous... 63. Amentiferæ.
Male flowers not in catkins, leaves evergreen 60. Urticaceæ.

Herbs.

Aquatics ... ... 59. Callitrichaceæ.
Terrestrial.
Juice milky ... ... 58. Euphorbiaceæ.
Juice watery.
Leaves with stipules ... ... 60. Urticaceæ.
Leaves without stipules ... ... 54. Chenopodiaceæ.

Flowers dioecious.

Trees or shrubs ... ... 63. Amentiferæ.
Herbaceous climbers ... ... 61. Cannabinaceæ.
Erect herbs.
Hairs stinging, Perianth 2 or 4 cleft ... 60. Urticaceæ.
Hairs not stinging, Perianth 3 cleft ... 58. Euphorbiaceæ.

54. CHENOPODIACEÆ.

Only two of the seven genera occur near Marlborough, the others being principally sea-coast plants. These two genera have many points in common, flat rather succulent leaves (either quite glabrous or covered more or less with a white mealy dust) and insignificant green flowers arranged in clusters and collected into spikes. The essential point of difference is the structure of the flowers, which in one genus have both stamens and pistil, and in the other are monœcious. This difference is still more perceptible in the fruiting state, for in *Chenopodium* the perianth, though persistent, is 5-partite and undergoes no alteration, whilst in *Atriplex* the perianth of the fertile flowers consists of two flat segments, which after flowering increase considerably in size and are frequently covered with wart-like excrescences. The plants are often very variable and it is not always easy to discriminate between them.

1. Chenopodium Linn.

Six species have been detected in Wiltshire, but only three have as yet been noticed near Marlborough.

Perennial; root thick fleshy; leaves triangular, dark green ... ... 3. Bonus-Henricus.

Annual.

Plant mealy, leaves obtusely toothed ... ... 1. album.
Plant not mealy, leaves coarsely toothed ... 2. rubrum.

1. C. album Linn. *Fat Hen.*

Bab. 293. Hook. 316. Benth. 388.

Cultivated and Waste Ground. A. July to November.

Stems from one to three feet high; leaves mealy, all stalked, very variable, lower more or less ovate, and always dentate, even if only in a slight degree, upper narrower, often very narrow, and entire; flowers in small compact heads (glomerules) arranged in spikes or racemes. Three forms are generally recognised, the first of which Dr. Syme believes will prove to be a distinct sub-species. These forms are (a) *candicans* Linn., glomerules in dense spikes, shorter than the leaves from which they spring, and which are dentate or bluntly serrate on the edges. (b) *viride* Linn., glomerules in lax branched, slightly drooping, spikes longer than the leaves from which they spring, and which are almost entire. (c) *paganum* Reich, glomerules in lax, branched, erect spikes, longer than the leaves from which they spring, and which are coarsely dentate or serrate below and narrow and entire above. This is the more usual form of the three, but the other two forms are occasionally met with.

1870. June 13.
1873. July 17.
1874. July 4.
1875. June 26 (Binck Knoll), July 1.
1876. July 5.

2. C. rubrum Linn. *Red Goosefoot.*

Bab. 294. Hook. 317. Benth. 388.

Borders of ponds and damp places. A. August, September.

Very variable in size; stems from a few inches to two feet or more high, simple or branched; leaves triangular, with a wedge-shaped base, the lower ones on long stalks, with large irregular teeth, the upper on shorter stalks, generally narrower, and with fewer teeth,—all rather fleshy, and often with a reddish tinge; flowers in short dense clusters, arranged on spikes, with a leaf at the base of each cluster, except the few terminal ones; seeds very small.

The fleshiness of the leaves would rather incline one to consider this as *C. botryoides*, but the shape of the leaves and other characters certainly refer it to *C. rubrum*.

Scarce. The only two localities where it is truly wild are about Pewsey and at Chisledon. By the former locality is meant to include, *Wick Farm*, *Draycott*. and *Martinsell*. It has also been found on a rubbish heap at the foot of Granham Hill, but of course only as a casual.

3. C. **Bonus-Henricus** Linn. *Good King Henry. Allgood.*

Bab. 294. Hook. 318. Benth. 389.

Waste places near Villages. P. May to Oct.

Root perennial, thick, fleshy; stems numerous, about a foot high, rarely branched, channelled; lower leaves triangular, sometimes rather arrow-shaped, with wavy edges and on long stalks, upper leaves more lanceolate and on shorter stalks: flowers crowded into dense compound terminal spikes, with only a few leaves in the lower part; stigmas long.

Very widely distributed, but not common.

I.—Railway Station, Marlborough; Clatford; Manton.

III.—Poulton; Binck Knoll; Ramsbury; Mildenhall.

IV.—Barton Farm.

1865. April 27.	1869. May 9.	1873. May 4.
1866. May 6.	1870. by April 25.	1874. May 9.
1867. ———	1871. May 17.	1875. full May 3.
1868. full May 19.	1872. April 26.	1876. May 11.

2. Atriplex Linn.

The species of this genus are exceedingly variable, and it is very difficult at times to discriminate between them. Bentham unites all our Marlborough species into one under the name *patula*, and Hooker seems to agree with him, though he goes so far as to consider 5 of Babington's species as 3 sub-species. Of these *A. Babingtonii* is a sea-side plant, and therefore not likely to be found near Marlborough—but of the other 4, three have certainly been detected, and the fourth will probably also soon be—hence it is included in the following table;

Lower leaves with a triangular base and two ascending lobes

Upper leaves lanceolate, spikes interrupted ... ... 1. angustifolia.

spikes dense ... ... 2. erecta.

Lower leaves hastate-triangular with spreading lobes

Upper leaves hastate, spikes dense ... ... 3. deltoidea.

Upper leaves lanceolate, spikes interrupted ... ... 4. hastata.

It will be necessary to say a few words about the leaves. In *angustifolia*, the leaves are occasionally all lanceolate, but generally a few of the lower leaves will have two lobes (one on each side) and pointing towards the *tip* of the leaf, so that the base of the leaf appears as if the stalk had been expanded

gradually. The same form also appears in the lower leaves of *erecta*; whence Hooker considers these two as forming two varieties of one sub-species. In the other two, *deltoidea* and *hastata*, the lower leaves are triangular, with the lobes on each side pointing away *from* the tip of the leaf. It must be confessed, however, that these forms are variable, and though the typical plants are distinct enough, there are numerous connecting links.

In addition to the form of the leaf, that of the fruiting perianth must also be noticed. Besides the ordinary perianth there are also a few much larger, which contain brown seeds, (the ordinary ones being black and polished). In *augustifolia* these larger perianths have no excrescences on them, but in all the other species they are more or less "muricated," as it is called, *i.e.*, covered with sharp points. Finally, in *angustifolia* and *hastata* the fruiting perianth is larger than the seed, in the other two species it scarcely exceeds it.

It will thus be seen that, as far as descriptions go, the differences seem but slight, but the *habit* of these species presents very marked differences. In the two first, the plants are dark green, with slender spreading stems, and are mostly prostrate, whilst in the other two the hue of the leaves is much lighter and the plants mostly erect. But with all this, it must be confessed that the reasons for uniting them are much more forcible than is usually the case.

I have followed Babington in the above distinctions, and he states that *erecta* is "common upon cultivated land," and such is certainly the case with what I have understood to be *erecta* but Dr. Syme states of *erecta* "very rare; I have seen it growing only at Twickenham," what most Authors consider to be *erecta* is named by him *serrata*, and this, he says, is often taken for the *A. erecta* of Hudson; "it has the branches more erect, and shorter in proportion to the central stems; the leaves being serrated and the perianth muricated on the back, are certainly little deserving of consideration as separating characters, as they are specially liable to variation in the genus *Atriplex*." Of *A. erecta* of Hudson he says, "it has the habit of *Chenopodium ficifolium*, with very stout stiffly erect stems, 18 inches to 3 feet high, and erect or erect-ascending branches; the lower ones much shorter than in the other two varieties. The fruit perianth is smaller, and the spikes much denser and more numerous, forming a great panicle like that of *A. deltoidea*, which it resembles also in the dense leafless spikes and small perianth, but the leaves are wedge-shaped at the base with the cusps ascending."

All the four forms, as given by Babington, occur about Marlborough, the former two certainly common: but I have not kept any records of the occurrence of the latter two, except that *A. deltoidea* has been found at Overton.

1. **A. angustifolia** Lin. *Common Orache.*

Bab. 295. Hook. 318. (*A. patula* var.) Benth. 392. (*A. patula* var.)

Cultivated land. A. July to Oct.

Very common.

2. **A. erecta** Huds. *Upright Orache.*

Bab. 296. Hook. 318. (*A. patula* var.) Benth 392. (*A. patula* var.)

Cultivated land. A. July to Oct.

Common.

3. **A. deltoidea** Bab. *Hastate Orache.*

Bab. 296. Hook 319. (*A. hastata* var). Benth 392. (*A. patula* var.)

Cultivated and waste ground. A. July to Oct.

Overton.

4. **A. hastata** Linn.

Bab. 296. Hook. 319. Benth.—?

Cultivated and waste ground. A. July to Oct.

This has certainly occurred about Marlborough, but I have not the records.

55. POLYGONACEÆ.

Herbs readily known by their thin, dry, semi-transparent stipules, which are united to form a ring round the stem, generally very conspicuous. Flowers small, the perianth green or pink: fruit a small seed-like nut, enclosed in the persistent perianth. The two (Marlborough) genera are very distinct in general habit, but are more readily distinguished by the segments of the perianth.

Perianth 6-parted, the 3 inner increasing with fruit 1 Rumex.

Perianth 5-parted, segments nearly all equal ... 2 Polygonum.

1. Rumex Linn.

The species of this genus at first are rather perplexing, but a careful attention to the perianth segments will greatly facilitate the discrimination.

In addition to the form of the enlarged segments, which varies with each species, one (sometimes all three) generally has a tubercle on its outer surface often very conspicuous. The species are all perennials with erect, furrowed stems.

Herbage not acid. Leaves not hastate.
- Enlarged petals toothed on the edge ... ... 3 obtusifolius.
- Enlarged petals without teeth
  - Enlarged petals long and narrow
    - Only one bearing a tubercle ... ... 2 sanguineus.
    - All three bearing tubercles ... ... 1 conglomeratus.
  - Enlarged petals ovate, blunt ... ... 4 crispus.
  - Enlarged petals triangular, pointed ... 5 Hydrolapathum.

Herbage acid—Lower leaves hastate.
- Leaves broad, inner segments of perianth enlarged in fruit ... ... 6 Acetosa.

Leaves narrow, inner segments not enlarged ... 7 Acetosella.

1. R. conglomeratus Murr. *Clustered Dock.*

Bab. 298. Hook 312. Benth 395.

Damp places. P. June to October.

Stems from 1—4 feet high, slender, simple, or sparingly branched. Leaves lanceolate, rather long, lower stalked, upper sessile. Flowers in distant whorls, each whorl, except the few terminal ones, accompanied with a leaf, unopened anthers white; enlarged petals rather broader near the base, each with a large tubercle.

Very common.

1865. June 20.	1869. June 10.	1873. June 30.
1866. June 28.	1870. July 2.	1874. June 27.
1867. not nearly out June 14.	1871. ———	1875. ———
1868. ———	1872. June 24.	1876. July 5.

2. R. sanguineus Linn. *Red-veined Dock.*

Bab. 298. Hook 312. Benth. 395.

Roadsides. P. June to Oct.

Very similar to the last, but differing in the leaves, which are often rather contracted above the base, so as to make them slightly fiddle-shaped; flowers in distinct whorls only the few lower ones having an accompanying leaf; unopened anthers pale yellow, enlarged petals rather broader above their middle, only one bearing a large tubercle.

The form occurring about Marlborough is the variety *viridis*, Sibth, in which the veins of the leaf are green or red only in the autumn.

Very common.

1865. June 18.	1872. June 25.	1875. June 17.
1870. July 4.	1873. July 8.	1876. July 5.
	1874. June 12.	

3. R. obtusifolious Linn. *Broad Dock.*

Bab. 299. Hook 311. Benth. 394.

Fields and Waste ground. P. June to Oct.

Stems from 2—3 feet high, branched, the branches ascending, forming only a small angle with the stem. Lower leaves often very large, oblong, cordate at the base, waved at the edges, long stalked; upper leaves narrower and more pointed, the veins often red, especially in the autumn; enlarged petals, ovate or bluntly triangular with a few teeth on each side or the lower part, one bearing a large tubercle, the two others having much smaller ones, often so small as to be considered only a slight thickening of the mid rib, generally red or tinged with red.

Very common.

1865. June 27.	1869. June 8.	1873. May 31.
1866. by June 28.	1870. June 5.	1874. June 6.
1867. not quite out June 15.	1871. ———	1875. June 12.
1868. May 19, June 2.	1872. June 13.	1876. June 27.

4. R. crispus Linn. *Curled Dock.*

Bab. 299. Hook 312. Benth 394.

Fields and Road-sides. P. May to Nov.

Stems from 2 to 3 feet high, branched, the branches short and ascending; lower leaves narrower than in the former species and much curled on the edges; the upper leaves much narrower, very much curled on the edges and rather fleshy; whorls of flowers crowded, the lowermost only leafy; enlarged petals ovate, sometimes slightly toothed, one bearing a large tubercle, the two others without any or only very small ones. The whole plant has generally a bright green appearance, though sometimes with a reddish tinge.

Very common.

1865. June 7.	1869. May 12.	1873. June 12.
1866. June 28.	1870. June 10.	1874. June 6.
1867. barely out, June 14.	1871. June 25.	1875. May 30.
1868. May 16.	1872. June 16.	1876. June 15.

5. R. Hydrolapathum Huds. *Great Water Dock.*

Bab. 300. Hook. 312. Benth. 395.

Ditches and River Sides. P. July to Oct.

Stems from 3 to 5 feet high, branched in the upper part, Radical leaves very large, often 2 feet long, rather leathery, acute, finely crisped on the edges, tapering below into a footstalk: stem leaves similar, but more abrupt at the base, and on shorter stalks, those at the base of the whorls being long and narrow. Whorls of flowers not crowded, and but very few of the lower ones with a leaf; the whole forming a very large panicle. Enlarged petals triangular, tapering to a point, each with a tubercle. A very fine handsome plant.

Common.

1870. July 9.	1873. July 10.	1875. ———
1872. June 24, one plant.	1874. July 22.	1876. bud July 5.

6. R. Acetosa Linn. *Sorrel.*

Bab. 300. Hook. 313. Benth. 396.

Meadows and pastures and open woods. P. May to August.

Stems about 2 feet high, unbranched, except in the upper part, decumbent at the base; radical leaves on very long stalks, oblong, sagittate at the base, rather fleshy, very acid, stem leaves similar but narrower and on shorter stalks, uppermost very narrow and sessile; flowers dicœcious or monœcious; enlarged petals orbicular, quite entire on the edges, generally red, and with a small tubercle on each, the 3 small outer sepals turned back on the stem.

Very common.

1865. Ap. 24, May 19.	1869. Ap. 27, May 7.	1873. May 6.
1866. Ap. 30, bud May 17.	1870. May 18.	1874. Ap. 30.
1867. May 25.	1871. May 20.	1875. May 16.
1868. full May 16.	1872. May 9.	1876. May 4, 14.

7. R. Acetosella Linn. *Sheep's Sorrel.*

Bab. 300. Hook. 313. Benth. 396.

Dry gravelly places. P. May to July.

Rootstock creeping, much branched; stems numerous, slender, from 3 or 4 to 10 inches high; leaves generally sagittate, narrow, rather fleshy, acid, the most stalked, upper sessile; flowers dicœcious in much branched panicles; lower whorls leafless.

Very common.

1865. by May 25.	1869. May 1.	1873. May 6.
1866. May 26.	1870. May 16.	1874. Ap. 26.
1867. June 10.	1871. by May 9.	1875. May 13.
1868. Ap. 25.	1872. Ap. 26, May 5.	1876. May 6.

Specimens occasionally as early as March and as late as October.

2. Polygonum Linn.

Herbs of very various habit, sometimes prostrate, twining or floating; flowers pale green or pink, either in the axils of the leaves or in terminal heads or spikes; this variety of habit renders the discrimination of them generally very easy.

Stem generally prostrate, flowers axillary ... 6. aviculare.
Stem slender, twining, flowers in small racemes ... ... 7. convolvulus.
Stem erect or floating.
Stems simple, racemes solitary.
Stem leaves very few, nearly sessile, styles 3 ... ... 1. Bistorta.
Stem leaves large, stalked, floating if in water... ... ... 2. amphibium.
Stems branched.
Spikes long and slender ... ... 5. Hydropiper.
Spikes dense.
Pedicels and perianths quite smooth ... ... 4. Persicaria.
Pedicels and perianths rough with glands ... ... 3. Lapathifolium.

1. P. Bistorta Linn. *Snakeweed.*

Bab. 301. Hook. 307. Benth. 399.
Moist meadows. P. May, June.

Rootstock twisted; stems from 1 to 2 feet high, solitary; radical leaves on long stalks, ovate, suddenly contracted below into a winged foot stalk, glaucous beneath; stem leaves few, cordate, nearly sessile. Flowers pink in a compact terminal oblong spike, styles 3.

Uncommon.

I.—Pewsey; Woodborough, *Rev. J. Sowerby*; Rectory Garden, Marlborough; near Clench Common, *Rev. C. W. Taylor*; New Mill, *J. J. Pulleine.*

III.—Water meadows, Marlborough; Mildenhall, *J. B. Gilmore, Esq., R. C. Davis.*

1865. by May 28. 1869. bud May 10, full May 23. 1873c. bud May 25. June 7
1866. ——— 1870. May 21. 1874. May 28.
1867. about May 13. 1871. by May 9.
1868. May 17. 1872. May 9.

2. P. amphibium Linn. *Amphibious Knot-grass.*

Bab. 301. Hook. 308. Benth. 400.
Ponds, ditches, &c., or on mud. P. June to Sep.

Stems simple, of variable length and, when growing in water, rooting at the nodes. Leaves long, varying from oval to narrow lanceolate, glabrous, on slender stalks, which allow the leaves to lie flat on the water; flowers pink, in a dense spike (rarely two on the same stem) raised a little above the water; styles 2. This is not unfrequently found growing on mud, having been thrown out when clearing the ditch or pond: in this case the stem becomes stiff and erect, the leaves longer, rather cordate at the base and always more acute at the apex, on shorter stalks, and covered with stiff rough hairs.

Not uncommon.

I.—Common in the Canal.

III.—Water meadows, Poulton; Ramsbury.

1868. June 6.	1871. bud May 26.	1874. June 12.
1869. bud May 27.	1872. June 15.	1875. July 3.
1870. June 10.	1873. June 13.	1876. July 1.

3. P. lapathifolium Linn. *Pale Knot-grass.*

Bab. 301. Hook. 308. Benth. 400.

Cultivated ground, wet and waste places. A. July to September.

Stems from one to two feet high, much branched, swollen at the nodes; leaves lanceolate, shortly stalked, generally marked with a black blotch, and often clothed with short hairs beneath, and scattered ones above; lower stipules without a fringe of hairs, upper ones shortly fringed; flowers generally green, in small spikes, sometimes interrupted below, the perianth and peduncles covered with yellow glands.

Not uncommon.

4. P. Persicaria Linn. *Common Persicaria.*

Bab. 302. Hook. 308. Benth. 400.

Waste and damp ground, fields, &c. A. June to November.

Similar in many respects to the last, from which it is distinguished by its redder tinge, its fringed stipules, and the perianth and peduncles perfectly glabrous.

Common.

1865. June 10.	1873. July 10.	1875. June 24.
1866. June 7.	1874. July 1.	1876. July 5.

5. P. Hydropiper Linn. *Water Pepper.*

Bab. 302. Hook. 309. Benth. 400.

Wet places. A. August to November.

Stems slender, decumbent at the base and rooting at the nodes; about one or two feet high; leaves lanceolate, shortly stalked; flowers in long lax

racemes, generally drooping; stipules fringed, and with the perianths dotted with small glands, causing the plant to be acrid or biting to the taste.

Widely distributed, but not common.

I.—New Mill, *Rev. J. Sowerby*; Clench, *R. R. P. Hilton.*

II.—Savernake Forest.

III.—Ramsbury; Chisledon; Mildenhall, *F. E. Thompson, Esq.*

6. P. aviculare Linn. *Knot-grass.*

Bab. 302. Hook. 309. Benth 398.

Fields and waste places. A. May or June, to Nov.

Stems slender, branched, prostrate, or (when growing among corn) ascending; leaves varying from ovate to narrow lanceolate, generally small, but very variable; stipules membranous, whitish, at length much torn; flowers from 1—5 in the axils of the leaves, pink, white, or green. It is an excessively variable plant, both in the length of the stems and size of the leaves.

Very common.

1865. June 15.	1869. ———	1873. June 12.
1866. not in fl. June 28.	1870. May 30.	1874. June 12.
1867. ———	1871. May 17.	1875. June 17.
1868. June 11.	1872. ———	1876. June 25.

8. P. Convolvulus Linn. *Black Bindweed.*

Bab. 303. Hook. 310. Benth. 399.

Cultivated land. A. June to Nov.

Stems long, slender, twining; leaves between cordate and sagittate, acute, stalked; lower flowers axillary, the upper ones in loose irregular racemes; the three outer sepals closely covering the triangular nut, and often having a sharp keel along the midrib.

Very common.

1865. June 7.	1873. July 1.	1875. June 19.
1870. June 13.	1874. June 30.	1876. June 29.

Fagopyrum esculentum Mœnch., or Buckwheat, has occasionally been cultivated, and consequently has been met with as an escape.

Stems erect, succulent, branched. Leaves cordate or sagittate; flowers pink in irregular flat-topped clusters.

It is generally included under *Polygonum*, but is separated from that genus by Babington on account of the structure and position of the embryo.

56. THYMELACEÆ.

There are only two species belonging to this Order occurring in Britain, and but one of them near Marlborough. The other species occurs in Wiltshire, but is beyond our proper limits.

1. Daphne Linn.

1. D. Laureola Linn. *Spurge Laurel.*

Bab. 304. Hook. 322. Benth. 402.

Woods and Thickets. Sh. Feb. to April.

An erect, glabrous, evergreen shrub, from 2 to 4 feet high (though growing higher in cultivation), slightly branched; leaves broadly lanceolate, contracted below into a very short stalk, crowded in the upper part of the stem, dark green, leathery; flowers in clusters or short racemes in the axils of the leaves; perianth green, tubular, with 4 spreading lobes at the top, scentless; bracts ovate, conspicuous.

Very local.

I.—Copse at the foot of Martinsell.

III.—Ramsbury.

1865. ———	1869. Feb. 13.	1873. by Feb. 1.
1866. ———	1870. Feb. 11.	1874. Jan. 21.
1867. Feb. 25.	1871. Feb. 16.	1875. Feb. 1.
1868. out a few days, Feb. 21.	1872. Feb. 9, (cult).	1876. Feb. 5.

D. Mezereum Linn, with sweet-scented purple flowers and deciduous leaves is said to grow in a copse near Hungerford.

57. SANTALACEÆ.

This order differs from Thymelaceæ in the perianth being combined with the ovary at its base, its lobes not overlapping one another when in bud, and other minute but important characters of the ovary. It is represented in Britain by only one species.

1. Thesium Linn.

1. T. humifusum D.C. *Bastard Toad-flax.*

Bab. 305. Hook. 324. Benth. 403.

Dry chalky pastures. P. July to October.

Rootstock woody, roots fibrous, attached to various plants; stems numerous, prostrate, (occasionally ascending at their extremities), 6—12 inches long; leaves very slender, linear, rather fleshy; flowers in racemes, which sometimes branch from their base; perianth small, green outside, white within; segments triangular, with a tooth on each side; fruit a small green nut, covered with the lobes of the perianth; each flower is generally on a separate peduncle, and has three bracts just below it, one much larger than the other two, and in this case "there is commonly no leaf at its base, but when there is more than one flower on the peduncle, each of these generally springs from the axil of a leaf or bract" (Syme).

Scarce; it was first detected in the neighbourhood by *Rev. J. J. Pulleine*, but was only rediscovered very lately by *W. H. Macdonald, Esq.*, on the Downs near Rabley Copse.

Pewsey Downs, *C. Steadman*, (*Rev. T. F. Ravenshaw.*)

58. EUPHORBIACEÆ.

A very extensive family (including about 180 genera and 3000 species) represented in England by only three genera, so different from one another that it seems strange at first sight that they could be classed together. The structure of the ovary is peculiar to this family among uniserual plants; it is 2 or 3 lobed, with as many cells and styles, each cell with one or two seeds; when ripe each carpel springs open, usually into two valves.

Flowers monœcious.

Tree or shrub, juice not milky	1.	Buxus.
Herbs, juice milky...	2.	Euphorbia.
Flowers dioecious	3.	mercurialis.

1. Buxus Linn.

1. **B. sempervirens** Linn. *Box.*

Bab. 307. Hook. 330. Benth 410.

Hedges, always planted. Sh. Feb. to May.

A shrub attaining a height of 6 or 8 feet at least, when left uncut; leaves oval, small, leathery, shining, opposite; flowers small, yellowish, in axillary clusters and sessile, usually several males and one or two females in a cluster; perianth 4-cleft, according to most authors; the number of divisions is variable, there being five in the male flowers and six in the female, some authors consider

that the male flower has four sepals and one bract, (similar to the sepals), and the female flower four sepals and three bracts,; Babington prefers to consider the male flower as having three sepals and two petals, and the female flower four sepals and three petals; stamens four; capsule with three horns, three celled, with two seeds in each cell.

Though not indigenous, it is introduced here, because there are some very fine box hedges in the neighbourhood, some as much as ten feet high.

1865.	April 29.	1869.	February 16.	1873.	March 15.
1866.	March 25.	1870.	March 17.	1874.	March 14.
1867.	April 1.	1871.	March 11.	1875.	(May 5).
1868.	March 14.	1872.	February 9.	1876.	March 18.

2. Euphorbia Linn.

All the British species are herbs, abounding in milky juice. The flowers are very peculiar, and for a long time their structure was not understood. They appear to consist of a bell-shaped perianth with four or five lobes, numerous stamens, a three-celled ovary with three styles, at the extremity of a long stalk springing from the centre of the flower. This perianth has now been found to be really an involucre of bracts; each stamen has its filament jointed, and has also a small scale at its base, consequently each stamen with its scale represents a single male flower, and therefore what appears to be a single flower is really a *head* of flowers, surrounded by an involucre of bracts, each head consisting of several male flowers (about 10—15), and a single female flower supported on a stalk. Between the lobes of the involucre are large yellowish *glands*, looking rather like rounded or crescent-shaped petals.

We have but four species near Marlborough.

Glands of the Involucre rounded... ... ... 1. Helioscopia.

Glands of the Involucre crescent shaped.

Bracts united at the base ... ... 2. amygdaloides.

Bracts free.

Leaves broadly ovate ... ... 3. Peplus.

Leaves linear ... ... 4. exigua.

1. E. Helioscopia Linn. *Sun Spurge.*

Bab. 307. Hook 326. Benth 406.

Cultivated ground. A. Ap. to Nov.

Stems from 6 to 8 inches high, leafy, simple, or with a few branches springing from near the base; leaves ovate, contracted below into a very

short stalk, serrated in the upper part; at the top of the stem springs an umbel of five rays, each ray once or twice forked at the end, the whole so arranged as to form a flat head; at the base of each of the primary and secondary rays is a floral leaf similar to, but broader than the stem leaves; glands of the Involucre rounded.

Very common.

1865. Ap. 20.	1869. all the year.	1873. Ap. 15.
1866. ———	1870. April 12.	1874. May 19.
1867. ———	1871. Ap. 15.	1875. May 10.
1868. nearly out, Mch. 18.	1872. Mch. 12, Ap. 29.	1876. Ap. 2.

Often lasts all the year.

2. **E. amygdaloides** Linn. *Wood Spurge.*

Bab. 308. Hook. 328. Benth. 409.

Woods and thickets. P. Ap. to Sep.

Rootstock woody, perennial; stems biennial, simple or with a few barren branches from the base; during the first year the stem attains a height of about 1 foot, clothed with leaves; leaves oblong-lanceolate, blunt, scarcely stalked, and increasing in size towards the apex of the stem, where they are so crowded as to form an imperfect rosette at the end of the year's growth; during the winter the lower leaves fall off, leaving scars on the red stems, the terminal rosette still remaining; "in the next year these barren stems elongate at the apex, leaving the spreading rosette of the previous year's leaves at the base of the new shoot, which lengthens till the whole is two or three feet high;" the leaves on the new stem are smaller and lighter coloured than those of the rosette: the new shoot is terminated by an umbel of from 5 to 10 rays, each ray having an oval floral leaf at its base and being itself often forked at its extremity: at the same time from the axil of most of the leaves of the new shoot springs a slender branch terminated by a flower head, the whole presenting a raceme-like inflorescence: below each head of flowers is a pair of greenish yellow bracts, united by their bases and presenting the appearance of a perianth. The whole plant, especially the second year's shoot, is more or less hairy and in the autumn is often tinged with red.

Common.

1865. Ap. 21.	1869. Mch. 4, 25, Ap. 2.	1873. Ap. 29.
1866. Ap. 30.	1870. May 12.	1874. Ap. 5.
1867. just in fl., Ap. 26.	1871. Ap. 25.	1875. May 5.
1868. Ap. 22.	1872. Ap. 13.	1876. May 1.

3. **E. Peplus** Linn. *Petty Spurge.*

Bab. 309. Hook. 328. Benth. 407.

Cultivated grounds. A. All the year.

Stems usually about 6 inches, but nearly a foot high in very vigorous plants, simple or more frequently branched from below, most of the side branches being barren: leaves broadly ovate, stalked, scattered along the stems and increasing in size towards the apex of the plant, entire; umbel of three rays, each with a floral leaf at its base, similar to, though rather larger than, the stem leaves; each ray is repeatedly forked (sometimes as much as 6 times), and at each fork is a pair of broadly ovate sessile leaves; the umbel therefore sometimes occupies nearly half the plant: involucral bracts lunate; with the horns very conspicuous.

Very common.

1869. all the year.	1872. May 9.	1875. May 5.
1870. April 8.	1873. April 3., May 11.	1876. ———
	1874. May 31.	

4. **E. exigua** Linn. *Dwarf Spurge.*

Bab 309. Hook 328. Benth. 408.

Cultivated fields. A. June to Nov.

Stems from 6—8 inches high, slender, solitary or branched from the base, clothed with long narrow leaves, blunt at the apex; umbel of 3 rays, rarely 4 or 5, each ray sometimes forked 5 or 6 times, causing the plant to assume very distinct forms; the terminal umbel often remains closed so that the plant presents the appearance of a solitary stem crowned with a small mass of flowers; at others the side branches are similarly terminated and in this species they not unfrequently became as large as the primary stem; at others the whole appearance of the plant is altered, presenting a bushy appearance with the broad triangular bracts at each fork of the stem obscuring the long and narrow stem-leaves.

Common.

1869. May 17.	1873. July 1.	1875. May 17.
1870. June 20.	1874. June 12.	1876. June 23.

3. Mercurialis Linn.

1. **M. perennis** Linn. *Dog's Mercury.*

Bab. 310. Hook. 330. Benth. 409.

Woods and thickets. P. Feb. to May.

Rootstock extensively creeping: stems about a foot high, simple, with a raised line on each side; leaves ovate-lanceolate, hairy, stalked, opposite, bluntly serrate, mainly in the upper half of the stem, those in the lower half

being small; stipules linear-lanceolate; flowers dioecious, male flowers in lax axillary spikes, consisting of a 3-parted perianth with 9—16 stamens, female flowers only from 1 to 3 on a spike, consisting of a 3-cleft perianth, 2 barren filaments, and a 2-celled ovary surmounted with a short forked style; capsules hairy.

Very common.

1865. Mch. 27.	1869. Feb. 13, Feb. 15.	1873. Feb. 11.
1866. Feb. 18, Feb. 26.	1870. Mch. 3.	1874. Feb. 1.
1867. Feb. 15, Feb. 22.	1871. Mch. 4.	1875. Mch. 5, Mch. 11.
1868. Feb. 26, Mch. 9.	1872. Feb. 9.	1876. Feb. 24, 29, (f.) Mch. 4.

The first dates are those of the male flowers, the second of the female.

59. CALLITRICHACEÆ.

Slender aquatic herbs, generally growing in water, but also on mud; flowers monoecious, solitary, minute, usually with 2 white bracts, but no perianth: male flower consisting of a single stamen with a rather conspicuous filament, the female flower of a 4-celled ovary with 2 styles. The ovary has the cells united in pairs, so that it may be described as 2-lobed; each lobe has a furrow along its back, indicating its partition into two. Of the 5 species according to Babington two have been detected about Marlborough, one of them only within the last year. Hooker places this order among Calyciflorae.

Lobes of ovary bluntly keeled on the back ... ... 1. verna.
Lobes of ovary winged on the back ... ... 2. stagnalis.

1. C. verna Linn. *Water Starwort.*

Bab. 311. Hook. 142. Benth. 413. (*C. aquatica.*)

Ponds and slow streams. A. or P. May to July.

Submersed leaves linear, upper leaves broad, floating, and placed so close together as to form a rosette, rarely wanting. Fruit nearly sessile, lobes bluntly keeled on the back, convex on the sides; styles and bracts deciduous.

Common.

1868. May 21.	1871. (May 12).	1874. May 6.
1869. May 7.	1872. May 24.	1875. May 3.
1870. Ap. 19.	1873. May 1, 13.	

2. C. stagnalis Scop.

Bab. 311. Hook. 142. (*C. platycarpa*). Benth—?

Common, especially on mud. A. or P. June to September.

Leaves similar to the last, only the floating leaves are often wanting: when growing in mud, the lower leaves became much broader, similar to, though smaller than, the floating leaves in the ordinary state: fruit twice as large as in *C. verna*, nearly sessile, lobes winged on the back; styles and bracts persistent.

When the lobes are parallel, it is the *C. Platycarpa* Kütz, which is the name adopted by Dr. Syme.

Has been found at Stype Wood.

60. URTICACEÆ.

Herbs with opposite leaves and stiff stinging hairs, conspicuous stipules and small unisexual flowers. The genus *Paristaria*, which is included in this order, is just the reverse in the above particulars, except that it has also hermaphrodite flowers, the hermaphrodite ones however not producing seed. The stamens, which are equal in number to the lobes of the perianth, are curiously elastic, being bent downwards in the bud, but springing backward at the slightest touch when the perianth has opened.

Leaves opposite—hairs stinging	...	...	2	Urtica.
Leaves alternate—hairs not stinging	...	...	1	Parietaria.

1. Parietaria Linn.

1. P. diffusa Koch. *Wall Pellitory.*

Bab. 312. Hook. 332. (*P. officinalis*). Benth. 414. (*P. officinalis*).

Old Walls. P. July to December.

Stems woody below, brittle, erect at first, but diffuse or ascending the second year, simple, or branched from the base, downy; leaves elliptic, stalked; flowers in small dense axillary clusters, with 2 bracts outside, each bract divided into 2 or 3 segments (considered to be free bracts by Babington) and between the two bracts is a female flower; perianth 4 or 5 cleft, stamens 4 or 5, pistil one, stigma tufted.

Walls at Ramsbury Manor.

2. Urtica Linn.

Male flowers with a 4-cleft perianth and 4 stamens, arranged in loose racemes or rather in clusters arranged in branched spikes; female flowers with a

2-cleft perianth (or if 4-cleft the 2 outer lobes very small), arranged like the male flowers only in denser clusters.

Spikes nearly simple not longer than the leaf-stalk ... 1 urens.
Spikes panicled, exceeding the leaf-stalk ... ... 2 dioica.

1. U. urens Linn. *Small Nettle.*

Bab. 312. Hook. 332. Benth. 413.

Farm yards and waste places. A. All the year.

Stem seldom more than a foot high, often much less, branched; leaves ovate, serrate, without any hairs except the stinging bristles. Flower spikes small, male and female flowers intermixed.

Commonly distributed.

It frequently lasts in flower the whole year, hence the irregularity in the dates.

1865. May 18.	1869. Feb., March, May 1.	1873. May 3.
1866. March. 10.	1870. May 24.	1874. all the year
1867. bud May 7.	1871. May 8.	1875. full May 3.
1868. May 21.	1872. by April 11.	1876. June 4.

2. U. dioica Linn. *Common Nettle.*

Bab. 313. Hook. 332. Benth. 414.

Waste Ground. P. May to Sep.

Rootstock creeping; stems erect 2 to 3 feet high; lower leaves cordate, upper broadly lanceolate, coarsely toothed, clothed with hairs besides the stinging bristles; flowers dioecious.

Very common.

1865 bud May 21, fl. before June 6.	1869. May 20.	1873. June 1.
1866. May 15.	1870. May 26.	1874. May 6, 26.
1867. June 10.	1871. May 26.	1875. May 17.
1868. just out May 19.	1872. May 30.	1876. June 3.

61. CANNABINACEÆ.

1. Humulus Linn.

1. H. Lupulus Linn. *Hop.*

Bab. 313. Hook. 333. Benth. 414.

Hedges. P. Aug., Sep.

Rootstock perennial; stems annual, very long, twining over bushes and other objects; leaves opposite, stalked, broadly cordate, deeply toothed and

clothed with rough hairs, often deeply divided into three or 5 segments; male flowers with a five cleft perianth and 5 stamens, in loose panicles; female flowers with a scale-like perianth, (which enlarges greatly after flowering), and arranged in spikes, so that they ultimately assume the form of the well-known catkins, also arranged in loose panicles.

Occurs occasionally but not commonly in the hedges.

62. ULMACEÆ.

A very small family. Trees with alternate deciduous leaves; flowers in small clusters, appearing before the leaves; perianth bell-shaped with 4 or 5 lobes at the top; stamens 5; ovary flat, winged all round; styles 2; fruit flat, thin and leaf-like.

Fruit slightly notched at the top... ... ... 2. montana.
Fruit deeply notched, the notch nearly reaching to the seed cavity ... ... 1. campestris.

1. U. campestris Sm. *Common Elm.*

Bab. 313. Hook. 334. Benth. 415.
Planted. Tree. March.

Trunk straight; leaves contracted into a rather short point at the tip, doubly serrate; fruit with the seed cavity at some distance from the notch.

Common.

1865. Ap. 8. 1869. Mch. 4. 1874. Mch. 7, 24.
1867. Mch. 31. 1872. Mch. 4.
1868. full bud, Feb. 16. 1873. Mch. 11.

2. U. montana With. *Wych Elm.*

Bab. 314. Hook. 334. Benth. 415.
Planted. Tree. Feb. to April.

Instead of the main trunk growing up straight, as in the former species, it breaks up, as it were, into several large branches after reaching a certain distance from the ground, and the main axis then becomes lost: the leaves are contracted with a point of some considerable length, and the seed cavity of the fruit is situated close to the notch.

The two species are very similar, but the above distinctions will generally serve to discriminate them.

Common.

1865. ———	1869. Feb. 5.	1873. bud, Mch. 11.
1866. Mch. 3.	1870. Ap. 1.	1874. Mch. 3.
1867. Feb. 28, Mch. 26.	1871. Mch. 11.	1875. Mch. 9.
1868. Feb. 27.	1872. Mch. 4.	1876. Feb. 28.

63. AMENTIFERÆ.

A very extensive family, and of varied structure, so that there are no less than four sub-orders in Britain, which are raised to the rank of orders by some Botanists. In all our plants the barren flowers are in catkins, i.e., each flower consisting of 2 (rarely 1) or more stamens and a scale, the whole arranged in a long spike, which falls off after flowering; the female flowers are clustered, solitary or in catkins. The flowers are sometimes minute and therefore difficult to distinguish without careful dissection.

Flowers dioecious.

Scales of male catkins entire... ... ... 1. Salix.
„ jagged at the edge ... ... 2. Populus.

Flowers monoecious.

Fertile flowers in catkins.

Catkins cylindrical, scales 3-lobed, 3-flowered ... 3. Betula.
„ ovoid, scales ovate, 2-flowered ... ... 4. Alnus.
„ cylindrical, lax, scales leaf-like, 2-flowered 9. Carpinus.

Fertile flowers in an involucre.

Fertile flowers, 2 together, stigmas 3 ... ... 5. Fagus.
„ 3 together, stigmas 6 ... ... 6. Castanea.
„ solitary (or clustered), stigmas 3... 7. Quercus.
„ several forming a bud, stigmas 2 8. Corylus.

In *Betula*, *Alnus*, *Carpinus*, and *Corylus* the male flowers are in cylindrical catkins.

In *Catanea* and *Quercus* they are arranged in very lax spikes, in *Quercus*, especially, being scattered along a stalk; whilst in *Fagus* the male flowers are arranged in pendulous globular catkins.

1. Salix Linn.

Trees or shrubs; male flowers consisting of two (rarely one) or more stamens attached to the base of a scale, which is clothed with long silky hairs, and which gives the young catkin a very silky appearance; there is also a gland-like scale at the base of the stamens, or one on each side, but no perianth;

female flowers consisting of a conical ovary and scale, with a second scale as in the male flowers; style forked; seeds several.

A very difficult and extensive genus, of which only nine species have yet been detected about Marlborough. As the flowers are dioecious, it is necessary to procure specimens from two plants, and also in most cases two other specimens from the same plants, as the catkins flower before the leaves appear. In the accompanying table, therefore, all these characters have been introduced to each species.

Male and female catkins on short leafy shoots.

Stamens 5 or more, leaves dark green, shining ...	1. pentandra.
Stamens 2.	
Capsule stalked, leaves green or glabrous ...	2. fragilis.
Capsule sessile, leaves ashy grey or silky white	3. alba.
Stamens 3.	
Capsule stalked, stigma nearly sessile, leaves broadly glabrous, lanceolate	4. triandra.
Male catkins sessile, female on very short stalks with or without two or three leafy bracts.	
Stamen 1, anthers purple, ultimately black.	
Style very short, stipules 0, leaves lanceolate	5. purpurea.
Style long, stipules linear, leaves linear-lanceolate	6. rubra.
Stamens 2, united below; anthers becoming yellow.	
Capsule shortly stalked, stipules small, leaves white and silky underneath	7. viminalis.
Stamens 2, free; leaves wrinkled, downy not silky beneath.	
Buds and twigs downy, leaves broadly lanceolate, pubescent above	8. cinerea.
Buds and twigs glabrous, leaves ovate, glabrous and dull green above	9. caprea.

1. **S. pentandra** Linn. *Bay-leaved Willow.*

Bab. 316. Hook. 336. Benth. 424.

Watery places. T. or Sh. May, June.

A tree or shrub, from 6 to 20 feet high; leaves ovate elliptic, contracted into a point, finely toothed, dark green and glossy above, paler below, thicker and more smooth and shining than in any other species; glutinous when young, fragrant; top of the leaf-stalks glandular; stipules oblong, obtuse, rarely present except in the form of a minute gland; filaments hairy;

capsules glabrous; male catkins at first erect, then pendulous; the latest flowering Willow.

Found at Knighton, near Ramsbury, by *H. Meyrick.*

2. S. fragilis Linn. *Crack-Willow.*

Bab. 316. Hook. 336. Benth. 424.

Damp meadows and Osier grounds. Tree. April, May.

A large bushy-headed tree with spreading branches, the twigs very fragile at their junction, especially when young; leaves long, narrow lanceolate, tapering to a fine point, finely serrate, glabrous, or slightly silky when young; stipules half-cordate, deciduous; top of the leaf-stalk often glandular; stamens two, rarely more; capsules glabrous; catkins appearing with the leaves, female catkins long and lax.

Bink-Knoll (certainly planted).

Poulton; Mildenhall.

3. S. alba Linn. *White Willow.*

Bab. 316. Hook. 337. Benth. 424.

Wet places. Tree. May.

A tall tree, sometimes 80ft. high; leaves narrow lanceolate, long pointed, finely toothed or serrate, covered with silky hairs, especially beneath, but often glabrous when old, never bright green; stipules minute, ovate-lanceolate, deciduous; stamens always 2; filaments hairy below the middle; capsule nearly sessile; catkins appearing with the leaves, slender, lax.

Mildenhall.

4. S. triandra Linn. *French Willow.*

Bab. 317. Hook. 336. Benth —.

Wet places and Osier grounds. Sh. or T. April to June.

A tree or shrub from 20 to 30 feet high; leaves broadly lanceolate, acute, serrate, glabrous, paler beneath; top of the leaf stalks slightly glandular; stipules large half-cordate; catkins lax, appearing with the leaves.

Common.

5. S. purpurea Linn. *Rose Willow.*

Bab. 317. Hook. 342. Benth. 425.

Marshes and River Banks. Sh. or T. March, April.

A shrub or small tree, 10 feet high; leaves often opposite, lanceolate, acute, broadest about or beyond the middle, finely serrate, glaucous, especially

beneath, turning black in drying; stipules 0; stamen 1; capsule ovate, very downy, sessile; catkins appearing before the leaves, males narrow cylindrical, closely packed, seldom an inch long when in flower, female catkins shortly stalked, especially when in flower, with a few leafy bracts at the base.

Widely distributed, but not common.

6. S. rubra Huds. *Purple Willow.*

Bab. 318. Hook. 343. Benth. 425. (*Salix purpurea* var).

Low meadows. T. or Sh. April, May.

Height 10 to 20 feet; leaves linear lanceolate, pointed, glabrous, green on both sides, "like those of *S. viminalis*, but without the white pubescence:" stipules linear; stamen 1, filament forked at the top; capsule very pubescent, style long.

Hooker considers this a hybrid between *S. purpurea* and *S. viminalis*, "with the leaves silky beneath, and the filaments usually more or less free." It is a common Osier-bed shrub.

Bentham considers it merely a cultivated form of *S. purpurea*, with narrower leaves.

Syme also considers this a hybrid between *S. purpurea* and *S. viminalis*, and states "leaves resembling those of the common osier in shape, but differing in being bright green and at length glabrous on both sides."

Not common.

7. S. viminalis Linn. *Common Osier.*

Bab. 318. Hook. 340. Benth. 425.

Wet places. Sh. April, May.

A shrub or small tree from 10 to 20 feet high, with long slender branches, downy when young; leaves very long and narrow, very white and silky beneath (more so than in any other of the long leaved species), with the edges entire and rolled inwards; stipules small, linear-lanceolate; stamens 2; capsule downy; catkins silky, appearing before the leaves.

Very common.

1872. Feb. 24. 1874. Mch. 24. 1876. Mch. 4.

1873. Mch. 25. 1875. Mch. 14?

8. S. cinerea Linn. *Sallow.*

Bab. 319. Hook. 337. Benth. 426 (*S. caprea*).

Moist places, woods, hedgerows, &c. T. or Sh. March, April.

A very variable plant, from a shrub a few feet high to a tree 20 feet or more high; young branches and buds downy; leaves elliptic lanceolate, pointed, the earlier ones entire, the latter ones serrate, wrinkled, downy and ashy beneath; stipules rather large, variable in shape; capsules on very long stalks.

Considered by Hooker as a sub-species, and by Bentham as a variety of the next, *S. caprea*.

Not common.

9. S. caprea Linn. *Great Sallow.*

Bab. 320. Hook. 337. Benth. 425.

Woods, hedgerows, &c. T. Feb. to April.

A tree from 15 to 30 feet high; with the young shoots and buds glabrous; leaves broadly ovate, flat, acute, spring leaves nearly entire, later leaves crenate-serrate, wavy at the margins, with a downy midrib, at length glabrous and dull green above, grey and cottony beneath; stipules half kidney-shaped; filaments glabrous; capsules silky on long stalks; catkins opening before the leaves, very thick, blunt, the female catkins at length cylindrical.

Some of the forms approach very near to *S. cinerea* (with which it is united by Bentham), "but that is a smaller shrub, with more rigid leaves, which are more attenuated at the base, duller green above, and with the veins more prominent beneath, and often dull orange: in *S. cinerea* the catkins are smaller; the anthers deeper yellow; the capsules smaller and more acute, and the young branches and even the buds more pubescent, the latter shorter." (*Dr. Syme*).

Very common. The earliest flowering of the genus.

1865. bud by Ap. 1.	1869. Feb. 16.	1873. Mch. 10.
1866. Mch. 4.	1870. Mch. 21.	1874. Mch. 2.
1867. Feb. 25.	1871. Mch. 7.	1875. Mch. 14.
1868. Feb. 23.	1872. Feb. 25.?	1876. Mch. 1.

2. Populus Linn.

Of the four British species only two have been observed about Marlborough, the tall straight Lombardy Popular (*P. fastigiata*) being a native of Asia, and not introduced into Europe till about 1590. The two kinds referred to above are very easily distinguished by the under side of the leaves.

Under side of the leaves and young shoots white and cottony 1. alba.

" " green and glabrous ... ... 2. nigra.

P. alba Linn. *White Poplar.*

Bab. 325. Hook. 335. Benth 424

Damp woods. T. March, April.

A tall tree 60 to 100 feet high with light grey bark, and sending out many suckers, the young shoots and under sides of the leaves densely cottony; leaves broadly cordate, irregularly toothed, on long, flattened stalks. Male catkins from 2 to 4 inches long, female shorter; stamens 6—10, anthers purple; scales deeply cut or lobed, hairy; perianth like a cup (considered to be the disk by Hooker, and not a perianth).

Very scarce, Bedwyn.

2. P. nigra Linn. *Black Poplar.*

Bab. 325. Hook. 335. Benth 429.

Damp places and river banks. T. March.

A tall quick-growing tree from 50 to 60 feet high, without suckers; leaves triangular, prolonged at the tip, but rounded at the other angles, serrated, silky beneath when young, glabrous when old, buds glutinous; male catkins 2 to 3 inches long, female shorter, the stalk curved in fruit; scales cut or lobed, hairy at the tips.

Not common—principally near the banks of the Kennet.

1865. by Ap. 18.	1869. full Mch. 7.	1873. ———
1866. ———	1870. Mch. 22.	1874. ———
1867. Feb. 27.	1871. by March 9.	1875. ———
1868. full Mch. 30.	1872. Mch. 3.	1876. ———

3. Betula Linn.

1. B. glutinosa Fries. *Common Birch.*

Bab. 326. Hook. 346. Benth. 419. (*B. alba.*)

Common. T. April, May.

A graceful tree, with slender drooping branches; bark flaking, silvery white; leaves broadly ovate, tapering at the apex, unequally serrate, glabrous and shining, with minute glandular dots when young. Male catkins drooping, each scale with 3 flowers; female catkins much smaller, each scale 3-lobed and also covering 3 flowers.

Common.

This is, I believe, the species about Marlborough, but I have unfortunately parted with my specimens. The other species *B. verrucosa* Ehrh, is a more graceful tree, never bushy, with the leaves more triangular,

the raised veins being on the upper side (not the under side as in *glutinosa*) and the scales of the fertile flowers with the lateral lobes more spreading.

1865. April 17.	1869. April 24.	1873. May 2.
1866. May 5.	1870. April 18.	1874. May 6.
1867. April 17.	1871. bud, April 1.	1875. full May 6.
1868. April 26.	1872. ———	1876. ———

4. Alnus Tourn.

1. A. glutinosa Gaert. *Alder.*

Bab. 326. Hook. 346. Benth. 418.

Wet places and river banks. T. or Sh. March.

A moderately large tree; trunk and branches crooked; leaves ovate or roundish, shortly stalked; sharply toothed and wavy on the edges, sometimes slightly lobed, glutinous; catkins appearing before the leaves; male long and pendent, female ovoid, with woody bracts, remaining long on the tree.

Scarce and local.

I.—New Mill, *Rev. J. Sowerby*; Woodborough, *Rev. J. Sowerby* and *F. E. Thompson, Esq.*

II.—Bedwyn.

III.—Ramsbury Park and Chilton Withy bed, *F. Meyrick.* Binck-Knoll, *Rev. J. Sowerby* and *F. E. Thompson, Esq.*

5. Fagus Linn.

1. F. sylvatica Linn. *Beech.*

Bab. 327. Hook. 344. Benth. 421.

Woods. T. May.

A large tree, with smooth grey bark; leaves pale green, ovate, dentate, strongly ciliate on the edges when young, glabrous when old. Catkins or flower heads silky, on silky stalks; the males pendent, the females erect, with two flowers, the four outer bracts thick, becoming almost woody in fruit, and clothed with stiff, bristly hairs.

Common.

1865. bud Ap. 24.	1869. Ap. 24.	1873. ———
1866. May 4.	1870. no buds May 28.	1874. May 3.
1867. ———	1871. May 3.	1875. full May 6.
1868. May 19.	1872. ———	1876. ———

6. Castanea Tourn.

1. C. vulgaris Lam. *Sweet Chestnut.*

Bab. 327. Hook. 479. Benth. ——

Planted. T. May.

A magnificent tree from 50 to 80 feet high; leaves oblong lanceolate, acute, serrate, glabrous; male catkins long, lax; female few-flowered, involucre divided into 4, enclosing 2 or 3 nuts, and clothed on the outside with numerous bristly spines. The fruit bears some resemblance to that of the Horse Chestnut (which is not considered as British), but is essentially distinct.

Very scarce; but few trees being known about Marlborough.

7. Quercus Linn.

1. Q. Robur Linn. *Oak.*

Bab. 327. Hook. 344. Benth. 423.

Woods. T. May.

A large tree; leaves ovate, irregularly sinuate; catkins appearing with the leaves, pendulous; flowers in distant clusters along the stalks. There are three forms (α) *Q. pedunculata* Ehrh; young branches glabrous, leaf-stalks short, fruit catkins long, stalked, fruit scattered (β) *Q. intermedia* Don; differing from the former in having the fruit catkins shortly stalked and fruit near together, (γ) *Q. sessiliflora* Salisb; young branches downy, leaf stalks long, fruit catkins nearly sessile, fruit near together.

Abundant.

1865. Ap. 24.	1869. Ap. 20.	1873. May 15.
1866. nearly out May 2.	1870. May 18.	1874. May 1.
1867. just in fl. May 6.	1871. May 12.	1875. May 15.
1868. May 14.	1872. May 8.	1876. May 20.

8. Corylus Linn.

1. C. Avellana Linn. *Hazel Nut.*

Bab. 327. Hook 345. Benth 420.

Hedges and copses. Sh. Jan. to April.

A shrubby tree with the young twigs downy and glandular; leaves broadly ovate, pointed, doubly serrate, and sometimes slightly lobed; male

catkins long and drooping, each flower consisting of 8 stamens and a scale to which they are fastened; fertile flowers crowded together and enclosed with bracts so as to resemble a leaf-bud, from which it may be known by the scarlet stigmas protruding from the top, each flower consists of an ovary with 2 long stigmas and surrounded by an involucre which increases very rapidly after flowering and forms the future *husk* of the nut.

Very common.

1865. Feb. 24, Mch. 10.	1869. —— Jan. 17.	1873. full Jan. 26.
1866. Feb. 12, Feb. 21.	1870. full Feb. 10.	1874. Jan. 20.
1867. full Feb. 9, Feb. 15.	1871. Feb. 18.	1875. Jan. 18.
1868. full Feb. 13, Feb. 16.	1872. Jan. 29.	1876. Jan. 23, 30.

9. Carpinus Linn.

1. C. Betulus Linn. *Hornbeam.*

Bab. 327. Hook. 345. Benth. 420.

Planted. T. Mch. to May.

A small tree with numerous short slender branches; leaves ovate, acute, deeply and sharply doubly serrate with parallel veins springing from the mid-rib; male catkins sessile, stamens crowned with a tuft of hairs; female catkins stalked, slender and often several inches long, and conspicuous for their long leafy bracts, the central one of which is much larger than the others.

Not common.

Savernake Forest; Rookley, *J. Pole.*

1865. Ap. 17.	1869. Mch. 16.	1873. just over May 3.
1866. over May 7.	1870. Ap. 26.	1874. ———
1867. Ap. 9.	1871. Mch. 24.	1875. ———
1868. Mch. 27.	1872. Ap. 17.	1876. ———

V. GYMNOSPERMÆ.

This division is distinguished from the other four by the seeds being apparently naked, not enclosed in any capsule or carpel. There is no calyx or corolla, but the carpel is spread out flat, exposing the seeds. There are but few representatives in Britain, though in cold regions there are several.

64. CONIFERÆ.

Male flowers consisting of 1 or more monadelphous stamens on a scale, and arranged in catkins which fall off after flowering; female flowers in cones or solitary, ovules naked, in pairs on the face of an open scale, or solitary.

Female flowers solitary	1 Taxus.
Female flowers in large, conical, woody cones ...	3 Pinus.
Female flowers in small, globose fleshy cones ...	2 Juniperus.

1. Taxus Linn.

1. T. baccata Linn. *Yew.*

Bab. 329. Hook. 349. Benth. 432.

Planted. T. Feb. to April.

A densely branched low tree, often attaining a great age; bark flaking; leaves long and narrow, flat, dark green above, paler beneath, arranged all round the branches, but spreading out in one plane; male catkins very small; female flowers solitary, with several bracts below and seated on a fleshy disc, which increases after flowering into a bright red cup, half enveloping the seed.

Common.

1865. Ap. 27.	1869. Feb. 13.	1873. June 25.
1866. Feb. 21.	1870. Mch. 12.	1874. full, Feb. 4.
1867. Feb. 22.	1871. by Mch. 3.	1875. Feb. 15.
1868. full Feb. 26.	1872. Feb. 13.	1876. Feb. 22.

2. Juniperus Linn.

1. J. communis Linn. *Juniper.*

Bab. 329. Hook. 348. Benth. 431.

Dry Hills. Sh. May.

A low bushy shrub, leaves 3 in each whorl, linear, pointed, glaucous and channelled above, dark green beneath; male flowers of from 4 to 7 anthers inserted on the lower edge of a scale, the whole forming a small catkin; female catkins barren below, but the 3 (or more) upper scales fleshy and coalescing, enclosing as many ovules; fruit a small berry formed of the succulent scales, globular, dark purple, of the size of a large pea.

Scarce—Occurs at Martinsell.

1868. Ap. 25.	1870. Ap. 25.	1873. full May 6.
1869. Ap. 20.	1872. Ap. 9.	1876. May 9.

3. Pinus Linn.

1. P. sylvestris Linn. *Scotch Fir.*

Bab. 329. Hook. 348. Benth. 430.

Scattered in clumps on the Downs—probably planted. T. May Jnne.

A tree with reddish bark; leaves stiff, awl-shaped, in pairs, surrounded at the base with short scales. Male catkins consisting of 2 scales with 2 anther cells on the inside of each. According to Bentham "this scale is merely the *connective* of the anther, and thus the whole catkin consists of nothing but anthers"; female catkins of scales, with 2 ovules at the base of each; in fruit these scales become hard and woody, each covering 2 winged seeds.

CLASS II. MONOCOTYLEDONS.

Upon referring to the first part of this Flora, it will be seen that the characteristics there pointed out are

One seed leaf.

Leaves parallel veined.

Stem without pith or bark.

Parts of the flower in multiples of 3.

Leaves not opposite or whorled.

It was also remarked that the above characters, though *generally* applicable, are not *universally* so, and hence we must never rely upon one character alone, when, however, an exception to any one of these occurs, it will be found that most, if not all, of the others will be applicable. The exceptions are very few.

Leaves net-veined...	1. Dictyogenæ.
Leaves parallel-veined.	
Parts of the perianth in whorls or wanting	2. Floridæ.
Parts of the perianth imbricate, bract-like	3. Glumiferæ.

DIVISION I. DICTYOGENÆ.

There are but two British species of this division, both occurring near Marlborough. They are very different in appearance.

Ovary superior; flowers perfect...	65. Trilliaceæ.
Ovary inferior; flowers dioecious	66. Dioscoreaceæ.

65. TRILLIACEÆ.

1. Paris Linn.

1. P. quadrifolia Linn. *Herb Paris.*

Bab. 330. Hook. 378. Benth. 472.

Damp woods. P. April to June.

Rootstock creeping; stem from 9 to 12 inches high, simple, terminated by a whorl of 4 ovate leaves (rarely 3, 5, or 6); flower solitary, terminal, on a short stalk (1 or 2 inches long) raising it above the leaves. Perianth in 8 divisions, the 4 outer lanceolate green, the 4 inner very narrow and of a rather yellow tint; stamens 8, the anthers situated half way down (really the connective between the anthers is lengthened out into a long point); ovary dark purple, 4 celled; styles 4; fruit a berry, with four cells, each with from 4 to 8 seeds.

Uncommon.

I.—West Woods, *F. J. H. Jenkinson*; Collingbourne Ducis, *Rev. W. C. Lukis* (*Rev. T. F. Ravenshaw*).

III.—Ramsbury:

IV.—Binck-Knoll.

1865. Ap. 27.	1869. by May 1.	1873. May 1.
1866. May 2.	1870. full May 18.	1874. ———
1867. Ap. 30, cult. Ap. 19 nearly.	1871. just out April 12.	1875. ———
1868. Ap. 21, Ap. 22, full at Ramsbury.	1872. cult. Ap. 14.	1876. May 6.

66. DIOSCOREACEÆ.

1. Tamus Linn.

1. T. communis Linn. *Black Bryony.*

Bab. 331. Hook. 366. Benth 470.

Hedges and Thickets. P. May to July.

Rootstock thick, fleshy, black; stem very long, twining, angular; leaves cordate, acute, shining, on long stalks; flowers dioecious, in axillary racemes, those of the male flowers much longer; perianth green, bell-shaped, 5 cleft; male with 6 stamens, female with the perianth adhering to the ovary, the limb of 6 segments; fruit a red, juicy, berry.

Not very common, though widely distributed.

1865. May 28.	1869. May 27.	1873. June 2.
1866. June 10.	1870. May 30.	1874. June 6.
1867. June 13.	1871. May 26.	1875. May 29.
1868. May 21.	1872. June 15.	1876. June 19.

DIVISION II. FLORIDÆ.

The perianth of the species in this Division is in many cases bright and coloured, in a few it is membranous, and in the last few Orders there is no true perianth.

In the following Table, it must be borne in mind that the characters only refer to Marlborough Plants, and therefore the distinctions may not be universally applicable.

Perianth petal-like.
- Perianth superior, ovary syncarpous.
  - Flowers dioecious ... ... 67. Hydrocharidaceæ.
  - Flowers hermaphrodite
    - Perianth irregular ... ... 68. Orchidaceæ.
    - Perianth regular
      - Stamens 3... ... ... 69. Iridaceæ.
      - Stamens 6... ... ... 70. Amaryllidaceæ.

Perianth inferior.
- Ovary apocarpous, or separable when ripe 71. Alismaceæ.
- Ovary syncarpous.
  - A small shrub ... ... 72. Asparagaceæ.
  - Herbaceous
    - Root not bulbous ... ... 72. Asparagaceæ.
    - Root bulbous
      - Flowers stalked ... ... 73. Liliaceæ.
      - Flowers springing from the ground like a Crocus ... 74. Melanthaceæ.

Perianth of thin dry segments ... ... 75. Juncaceæ.

Perianth wanting, or of 4 small scale-like parts.
- Land plants—leaves net-veined ... ... 77. Araceæ.
- Water plants.
  - Small floating, leaf-like pants ... 78. Lemnaceæ.
  - Tall reed-like plants, flowers in dense spike or globose clusters ... 76. Typhaceæ.
  - Plants wholly submersed or floating, except the flower spike (when present) ... ... 79. Potamogetonaceæ.

So few representatives of some of the above Orders occur near Marlborough, that it is deemed best to give the above rather unscientific table, than burden it with characters which are applicable to only one species.

67. HYDROCHARIDACEÆ.

1. Anacharis Rich.

1. A. Alsinastrum Bab. *Water Thyme.*

Bab. 332. Hook. 350. (*A. canadensis.*) Benth. 448. (*Elodea canadensis.*)

Cana'a and rivers. P. June, July.

Plant wholly submersed; stems very brittle at the joints, branched, rooting; leaves oval-oblong, blunt, serrate, 3 in a whorl, rarely 4 or 2; male flowers not known in this country: female flowers sessile, axillary, with a very long tube, variable in length but always long enough to allow the limb to expand on the surface of the water, limb in 6 divisions, the 3 outer green, the 3 inner pink and petal-like: the lower part of the flower protected by a spathe, springing from the axil of a leaf like bract, placed within the whorl of leaves: stamens represented by 3 narrow flat filaments; stigmas 3.

Common in the Canal.

68. ORCHIDACEÆ.

A most interesting order of plants, especially after the discoveries of Darwin with respect to the fertilization of the species. The general structure of a flower is as follows: ovary of 3 carpels, inferior, sessile, with a bract at its base; stamens 3 united into a central column on the top of the ovary, the two lateral abortive, the pollen united into two masses, called pollinia, contained in two cavities of the staminal column; style united with the staminal column, the stigma a viscid space in front of the column; sepals 3, often coloured; petals 3, one in front unlike the other two and generally with a lobe and spur, sometimes of considerable size (no allusion is made to the genus *Cypripedium*, as it is not a Marlborough p'ant).

I have taken several hints in the following Table from Bentham, for, as he rightly says, the genera are distinguished chiefly by the form and arrangement of the pollinia and stigma, and the shape and direction of the lip, characters which are difficult for beginners and still more so to describe with any clearness, in mere words. A study of Darwin's work will alone enable a person to thoroughly understand the genus.

Plant brown, leafless, stem leaves reduced to scales ... 8. Neottia.

Plant green, stem leaves like bracts... ... ... 6. Spiranthes.

Stem with leaves, especially below.

Perianth with a spur.

Flowers red or purple, pollinia in pouches 1. Orchis.

Flowers white or green, pollinia exposed... 2. Gymnadenia.

Perianth without a spur.
Lip larger than sepals, hanging, narrow.
Stem with only a pair of large leaves 7. Listera.
Stem leafy below... ... ... 4. Ophrys.
Lip larger than sepals, hanging, broad... ... 4. Ophrys.
Lip not larger than sepals, erect or spreading
Flowers stalked, drooping ... ... 9. Epipactis.
Flowers sessile.
Plant at least 1 foot high ... ...10.Cephalanthera.
Plant not more than 6 inches high.
Flowers all round the spike ... 5. Herminium.
Flower spikes one sided, twisted 6. Spiranthes.

1. Orchis Linn.

Rootstock producing a fleshy tuber each year beside the decaying one of the previous year, the following year's stem produced from the summit of the new tuber. Flowers in a terminal spike, red or purple. Pollinia contained in two cavities in the column, and protected by two flaps so as to be concealed from view.

Spur long and slender... ... ... 7. pyramidalis.
Spur not less than half the length of ovary.
Sepals converging so as to form a hood over the column ... ... 1. Morio.
Sepals spreading.
Spike lax, tubers entire ... ... 2. mascula.
Spike dense, tubers lobed ... ...
Stem solid, bracts shorter than the lilac flowers,... ... ... 4. maculata.
Stem hollow, bracts longer than the purple flowers.
Leaves broadest about their middle, not hooded ... ... 5. latifolia.
Leaves broadest below, not hooded 6. incarnata.
Spur very short ... ... 3. ustulata.

1. O. Morio Linn. *Green-winged Orchis.*

Bab. 335. Hook 353. Benth. 457.

Meadows and pastures. P. April to June.

Tubers entire; stem from 3 or 4 to 12 inches high; sepals forming a hood over the column, with very distinct green veins; flowers of all shades from pure white to dark purple, in all the lighter varieties the green veins of the sepals are very distinct.

Common.

1865. Ap. 29.	1869. Ap. 20, May 1.	1873. May 10.
1866. May 5.	1870. May 12.	1874. Ap. 29.
1867. May 6.	1871. May 1.	1875. by May 5.
1868. Ap. 30.	1872. Ap. 15.	1876. May 4.

2. O. mascula Linn. *Early Purple Orchis.*

Bab. 335. Hook. 352. Benth. 458.

Woods and pastures. P. April to June.

Tubers entire; stem from 6 to 18 inches high; two lateral sepals spreading, or bent back, not arching over the column; flowers in a loose spike, purple, rarely white; leaves generally spotted, with dark round spots, whence this has not unfrequently been confused with the Spotted Orchis (*O. maculata*).

Common.

1865. Ap. 24.	1869. Ap. 11.	1873. April 19.
1866. Ap. 24.	1870. Ap. 19.	1874. c. bud, Ap. 5., Ap. 24.
1867. Ap. 19.	1871. Ap. 20.	1875. by May 5.
1868. full, Ap. 21.	1872. Ap. 9.	1876. by May 1.

3. O. ustulata Linn. *Dwarf Dark-winged Orchis.*

Bab. 336. Hook. 353. Benth. 458.

Chalk Downs. P. May, June.

Tubers entire; stem rarely 6 inches high; spur very short, sepals converging into a roundish helmet including the petals; helmet dark, purple, lip white with a few purple spots; spike dense, dark purple at the top, pale below; the top of the spike has a scorched appearance, whence the name. A white variety has been found on Martinsell by *Rev. J. Sowerby*.

Not common.

I.—Martinsell, *C. W. Everard*; Pewsey Downs, *Rev. T. F. Ravenshaw*.

III.—Near Rabley.

IV.—Rookley; Downs near the Devil's Den.

1865. May 23.	1869. May 17.	1873. May 31.
1866. May 29.	1870. May 29.	1874. June 3.
1867. May 29.	1871. June 2.	1875. ———
1868. May 19.	1872. May 5.	1876. June 22

4. O. maculata Linn. *Spotted Hand-Orchis.*

Bab. 337. Hook. 353. Benth. 459.

Damp woods and pastures. P. May to July.

Tubers palmate; stems about a foot high, solid during flowering, flowers pale purple with darker markings; lower bracts exceeding the ovary sometimes longer than the flowers; lower leaves broad and blunt, upper narrow and pointed, almost always spotted with purple; white varieties very scarce.

Common.

1865. May 23.	1869. May 27.	1873. June 2.
1866. June 6.	1870. May 30.	1874. May 28.
1867. June 7, 11	1871. June 11.	1875. June 3.
1868. May 20.	1872. June 4.	1876. June 11.

5. O. latifolia Linn. *Marsh Orchis.*

Bab. 337. Hook. 352. Benth. 459.

Marshes and damp Meadows. P. May, June.

Tubers palmate; stems from 12 to 18 inches high, hollow and stout; flowers similar to those of *maculata*, but not of the same colour, generally of a bright purple, and often pinkish; leaves generally broad and numerous, broadest about their middle and flat at the tip, often faintly spotted; lower bracts exceeding the flowers.

Scarce.

I.—Lockeridge, *Rev. J. Sowerby*; Martinsell, *H. F. im Thurn*; Manningford Bruce, *Rev. T. F. Ravenshaw.*

III.—Axford, *J. C. Palmer* and *E. F. im Thurn*; Mildenhall, *W. W. Melville*: Stitchcombe, *Rev. J. Sowerby.*

6. O. incarnata Linn.

Bab. 337. Hook. 353. Benth.——

Marshes. P. June, July.

Very similar to the last, with which it is often united; the main differences between the two being in the leaves, which are broadest at the base and narrowed upwards, with a hooded tip; the bracts also all usually exceed the flowers. Syme also says that the leaves of *latifolia* are often spotted with dark purple, and the flowers rather smaller, darker and redder than in *incarnata.*

"Generally in perfection in the middle of June, when *latifolia* is mostly past flowering. Bab.

II.—Great Bedwyn, *F.E. Thompson, Esq.*

III.—Axford; Mildenhall; and Ramsbury, *F. Storr, Esq.*

I give the above localities with some diffidence; it was some time before I could distinguish between the two, and even now I have some difficulty with certain specimens. My own opinion, borne out by my notes is that *incarnata* is the earlier one of the two. It was so stated in Babington's earlier edition, but has been altered in the two last.

7. O. pyramidalis Linn. *Pyramidal Orchis.*

Bab. 337. Hook. 354. Benth. 460.

Pastures. P. June, July.

Tubers entire; stem about a foot high; flowers rose purple, spike dense, at first pyramidal, afterwards cylindrical; spur long and slender, lip with 3 equal lobes and two raised tubercles at the base on each side of the entrance to the spur; leaves long, narrow, acute.

Not common but widely distributed, and more abundant in some years than in others.

1865. ———	1868. June 8.	1873. June 28.(Binck Knoll), July 12.
1866. June 21.	1869. June 10.	1874. full June 12.
1867. ———	1870. June 18.	1875. June 19.
		1876. June 23.

2. Gymnadenia R. Br.

Differs from *Orchis* in having the pollinia exposed without a pouch; it is often included in that genus.

1. G. conopsea R. Br. *Fragrant Orchis.*

Bab. 338. Hook. 354. Benth. 460. (*Orchis.*)

Pastures. P. June.

Tubers palmate; stem about a foot high; spike rather lax and long; flowers rose purple, fragrant; spur very long and slender; lip with three equal lobes; leaves long and narrow.

Not common.

I.—Clench; Matinsell, *J. W. Mills*; Chalk Pit, Pewsey Road, *R. W. P. Hilton*; Clatford Vale, *H. A. Evans*; Pewsey Downs, *Rev. F. T. Ravenshaw.*

III.—Row-Down, *G. F. Ruck*; Rainscombe, *Rev. J. Sowerby.*

IV.—Silbury, *F. E. Thompson, Esq.*

1865.	June 5.	1869.	June 5.	1873.	June 13.
1866.	June 21.	1870.	June 14.	1874.	June 12.
1867.	June 18.	1871.	———	1875.	June 3.
1868.	June 1.	1872.	June 1.	1876.	June 15.

3. Habenaria R. Br.

Differs from *Orchis* in having the pollinia exposed, without a pouch; there are other differences, but too minute for beginners.

Spur very short ... ... 1. viridis.
Spur very long:
Pollinia parallel 2. bifolia.
Pollinia wider apart below ... ... 3. chloranthа.

1. H. viridis R. Br. *Frog Orchis.*
Bab. 339. Hook. 355. Benth. 461.
Pastures. P. May to July.

Tubers palmate; stem about six or eight inches high, with a few broad ovate leaves; flowers green, tinged with brown, in a rather dense spike; spur very short; lip long and narrow, bent downwards, with three points at the tip, the middle one very variable in size; bracts about as long as the flowers.

Very scarce.

I.—Martinsell, *J. W. Mills;* Oare, *F. Storr, Esq.*

II.—Rather plentifully one year among the fir trees at the entrance of the Forest, near the Hungerford Road, *D. Womersley;* and on Rabley Downs, *W. G. Hughes;* Bedwyn, *Rev. J. Sowerby;* Savernake Forest, *J. J. Pulleine;* Great Bedwyn, *J. W. Mills.*

III. Rabley, *W. W. Dayman;* Chisledon, *J. C. Palmer* and *E. F im. Thurn.*

1866. June 9. 1868. June14.oult. May 21. 1872. May24. 1875. July 26.
1867. full budMay 23. 1869.about May 22. 1873.(July10.)

2. H. bifolia R. Br.
Bab. 339. Hook. 355. Benth. 460.
Heathy places. P. June, July.

Tubers entire; stem about a foot high, with a pair of leaves at its base, and small scattered pointed leaves along its length; spike short, lax; flowers

white, very sweet scented, especially in the evening; spur very long; anther cells parallel to one another.

Very scarce. A specimen has been gathered in Savernake Forest, by *T. W. Jones*; and several in a heathy spot in the West Woods in 1873, the latter spot has since been dug up for cultivation. Also at Mildenhall, *F. Storr, Esq.*

3. H. chlorantha Bab. *Butterfly Orchis*

Bab. 339. Hook. 355. Benth. 460.

Moist woods and thickets. P. May to July.

Closely allied to the last with which it is often united, but is very distinct in appearance: it is a larger and stouter plant in all its parts, and in addition to minute, but important differences, the distance between the anther cells is twice as great below as at the top.

Common.

1865. May 31.	1869. May 3.	1873. June 2.
1866. June 11.	1870. May 21.	1874. May 28.
1867. cult. June 3, June 7.	1871. May 17.	1875. by June 1.
1868. May 21.	1872. May 24.	1876. (May 27) bud June 11.

4. Ophrys Linn.

A very singular genus in the appearance of the flowers, resembling insects at a first glance. It differs from *Orchis* in having no spur on the lower lip, which is variously modified in shape, and in other minute, but important characters. The peculiar structure of the plants of this Order is such that in almost every single instance the intervention of insects is absolutely necessary to secure the fertilization of the flowers, the only exception among British flowers being the *Ophrys apifera*, in this genus. Only two species have yet been detected about Marlborough.

Lip broad, not longer than the sepals ... ... 1 apifera.

Lip narrow, much longer than the sepals ... ... 2 muscifera.

1. O. apifera Huds. *Bee Orchis.*

Bab. 339. Hook. 356. Benth. 462.

Dry pastures. P. June, July.

Tubers entire; stem about a foot high; spike of from 2 or 3 to 6 large flowers; sepals pink, or pinkish; 2 lateral petals smaller than the sepals and of the same colour; lip dark brown with yellow markings, broad and with its

edges turned inwards so as to present a convex shape, downy on the edges, smooth in the middle.

Rare. Martinsell, *A. Armstrong, Esq.*; Picket Hill, *Mr. E. Goodman*, (*Rev. T. F. Ravenshaw*); Chisbury wood, *Rev. J. Sowerby*; Binck Knoll, *A. E. Townsend*; White Horse Down, *M. O. Alison*.

1866. June 17. 1873. June 28.
1868. bud June 3, June 21. 1875. July 3.

2. O. **muscifera** Huds. *Fly Orchis.*

Bab. 340. Hook. 357. Benth. 468.

Damp thickets. P. May June,

A much more delicate plant than the last, with a slender spike of 3 or 4 flowers; sepals narrow-ovate, green; lateral petals very narrow, purple, lip brownish purple with a central bluish spot, the two laternal lobes turned down, the central lobe with a deep notch; the whole flower looks very like a fly.

Very scarce. Has only been found at Binck Knoll by *T. N. H. Smith*.

5. Herminium R. Br.

1. H. **Monorchis** R. Br. *Musk Orchis.*

Bab. 340. Hook. 356. Benth. 462.

Chalky Downs. P. June, July.

Tubers nearly globular, like those of an *Orchis*, but the new one instead of being produced close to the stem is formed at the end of one of the fibres proceeding from the crown, thus forming a creeping rootstock; stem slender, rarely 6 inches high, with 2 (rarely 3) broadly lanceolate leaves at the base; spike slender; flowers small, yellowish green; sepals broad, lateral petals narrower, longer and obscurely toothed at the side, lip 3-lobed, the middle lobe longest.

Very scarce. Has been found this year in Black Burney Bottom by *E. F. im Thurn, Esq.*

6. Spiranthes Rich.

1. S. **autumnalis** Rich. *Lady's Tresses.*

Bab. 340. Hook. 359. Benth. 455.

Dry pastures. P. Aug. to Oct.

Rootstock producing 2 or 3 thick oblong tubers, and a tuft of spreading radical leaves; flowering stems by the side of the tuft of leaves, from 4 to 6 inches high with a few short sheathing pointed scales; spike dense, twisted; flowers small, very sweet scented, white, the two lateral sepals covering the base of the lip, the upper sepal cohering with the petals.

Very uncertain—sometimes not uncommon on the Downs, at others very scarce.

I.—Near Clench, *W. W. Dayman*; Pentawick, *J. J. Pulleine*; Wick Farm, *Rev. J. Sowerby*.

III.—Between Four and Five-mile Clumps, *A. C.* and *H. M. Hilton*.

1866. Sep. 10.	1870. Sep. 13.
1869. Sep. 2.	1871. Sep. 29.

7. Listera R. Br.

1. L. ovata R. Br. — *Tway-blade.*

Bab. 341, Hook. 359. Benth. 453.

Woods. P. May to July.

Rootstock with a mass of thickish fibres; stem from 1 to 2 feet high, slender, with a pair of large ovate leaves at about 6 inches from the ground; raceme long and slender; flowers numerous, greenish yellow; sepals ovate, acute, deep green; lateral petals narrower; lip much longer and narrower and with a deep notch at the end, and a central nectar-secreting furrow.

Common.

1865. May 24.	1869. May 5.	1873. May 24.
1866. May 21.	1870. May 20.	1874. May 23.
1867. May 15.	1871. May 17.	1875. May 24, June 3.
1868. May 9.	1872. May 16.	1876. May 20.

8. Neottia Linn.

1. N. Nidus-avis Rich. — *Bird's Nest.*

Bab. 341. Hook. 359. Benth. 454.

Shady Woods. P. May, June.

The whole plant pale brown, and not unlike a Broom-rape at first sight, said to be a root-parasite by Hooker. Rootstalk furnished with a number of fleshy fibres; stem from 12 to 18 inches high with a few sheathing scales in-

stead of leaves; sepals broadly ovate, acute; lateral petals more rounded, lip long, divided at the tip into two spreading lobes.

Scarce.

I.—Westwoods; Damp Copses near Pewsey; Martinsell; Manton Copse.

II.—Bedwyn, *J. W. Mills.*

III.—Axford, *A. H. G. Skrine*; Rabley.

1865. May 19.	1869. ———	1873. June 5.
1866. May 29.	1870. full, June 11.	1874. May 31.
1867. May 9.	1871. ———	1875. May 17.
1868. May 6.	1872. by May 30.	1876. by May 20.

9. Epipactis Rich.

1. E. latifolia All. *Helleborine.*

Bab. 341. Hook. 357. Benth. 452.

Woods. P. July, Aug.

Rootstock creeping, with rather thick fibres; stems from 1 to 2 feet or more high, leafy; the lowermost leaves reduced to sheaths; leaves broadly ovate, clasping the stem, but getting narrower, more pointed, and less sheathing as they ascend the stem, passing imperceptibly into the bracts, the lower ones often longer than the flowers; flowers many, in a loose one-sided raceme, pendulous; the sepals and two lateral petals similar, broadly ovate and generally dull purple, the petals rather shorter than the sepals; the lip thick and concave at the base; the terminal portion broad and petal-like with two protuberances at its base.

Very scarce.

I.—Manton Copse, *J. J. Pulleine, Rev. J. Sowerby.* Westwoods, *A. Marshall.*

II.—Savernake Forest, *Rev. J. Sowerby, T. B. Lediard.*

III.—Axford; Rabley, *J. Pole.*

IV.—Overton Dell, *Miss Ada Preston.*

10. Cephalanthera Rich.

1. C. grandiflora Bab. *White Helleborine.*

Bab. 343. Hook. 358. Benth. 453.

Woods. P. June.

Rootstock fibrous; stem from 12 to 18 inches high, leafy; leaves broadly ovate, clasping, and, as in *Epipactis*, passing gradually into the bracts, the

lower ones exceeding the flowers; flowers creamy white, large, sessile, erect in a terminal spike; sepals and petals as in *Epipactis*, but not so spreading and the lip has not the two protuberances at the base.

Very scarce.

Copse at the foot of Oare Hill, *F. Storr, Esq.*

Rabley Copse, *J. Pole.*

1865. by June 7.	1870. bud June 17.
1868. full May 21.	1871. young bud May 17.
1869. June 10.	1874. full June 12.

69. IRIDACEÆ.

The principal peculiarity of plants in this order is in the stigmas which are often flattened out so as to look like petals. The leaves are also equitant, *i.e.*, arranged on opposite sides of the stem and folded vertically, not horizontally, so that the opening is towards the stem. The only Marlborough species have this peculiarity.

1. Iris Linn.

Perianth 6 cleft, the 3 outer segments (called fall-petals by Florists) large, and reflexed, the three inner much smaller, and erect; stamens 3; style 1; stigmas 3; dilated like petals each one covering a stamen; these stigmas are actually larger than the inner perianth segments and might cause confusion to beginners, their position inside the stamens would prove their true structure.

Flowers yellow; inner perianth segments shorter than the stigmas ... ... 4. Pseudacorus.

Flowers violet blue; inner perianth segments equalling the stigmas ... ... 2. fœtidissima.

1. I. Pseud-acorus Linn. *Yellow Flag.*

Bab. 385. Hook. 363. Benth. 465.

Wet places. P. May, June.

Rootstock thick, horizontal, sending out numerous fibres below; stems 2 to 4 feet high, leafy; leaves swordshaped, the lower ones often longer than the flowering stem, upper ones shorter; flowers bright yellow, 2 or 3 on each stalk, each proceeding from a large bract covering the ovary.

Common.

1865. May 27.	1869. May 15.	1873. June 2.
1866. by June 6.	1870. May 30.	1874. June 12.
1867. by June 10.	1871. May 26.	1875. May 30.
1868. May 19.	1872. June 9.	1876. June 4?

2. I. fœtidissima Linn. *Gladdon.*

Bab. 345. Hook. 363. Benth. 465.

Woods and thickets. P. June, July.

A smaller plant than the last in all its parts; stem angled, 2 feet high; outer perianth segments narrow ovate, inner about two thirds of their length, about equalling the stigmas. Flowers lead-coloured or bluish, rarely yellow; herb green not glaucous, yielding an unpleasant smell when bruised, (compared by some to the smell of roast beef, "to which it is no compliment.")

In a strip of copsewood along the Wan's Dyke at the top of Clatford Vale, but which has since been rooted up.

70. AMARYLLIDACEÆ.

Rootstock bulbous, leaves grassy, perianth petaloid, ovary inferior. We have but single representatives of two genera about Marlborough.

Perianth tubular at the base, with a crown at the mouth of the tube ... ... 1. Narcissus.

Perianth divided to the ovary, without any crown ... ... 2. Galanthus.

1. Narcissus Linn.

1. N. Pseudo-narcissus Linn. *Daffodil.*

Bab. 347. Hook. 365. Benth. 468.

Open woods and pastures. P. Feb. to Ap.

Leaves about 2 or 3, linear, blunt, not keeled, of a bluish green. Flowers solitary, on a 2-edged stalk; perianth tube about an inch long in fine specimens, wider at the top, the segments ovate, about as long as the tube; the crown very conspicuous about as long as the segments.

Abundant where it grows, but very local.

I.—Various parts of the West Woods; Clatford Park Farm: near Oare Hill, *Rev. T. F. Ravenshaw*; Clench, *J. W. Mills.*

II.—Near Puthall Gate.

IV.—Rockley, *S. F. Townsend.*

1865. bud Ap. 1, over Ap. 20.	1869. full Feb. 20, cult, Feb. 10.	1873. Mch. 10.
1866. Mch. 6.	1870. Mch. 25.	1874. Mch. 4.
1867. Feb. 22.	1871. Mch. 10.	1875. Mch. 10.
1868. by Feb. 26.	1872. Feb. 26.	1876. Feb. 29.

2. Galanthus Linn.

1. G. nivalis Linn. *Snowdrop.*

Bab. 348. Hook. 365. Benth. 469.

Woods and pastures, probably always planted. P. Jan. to April.

About 6 inches high; flowers solitary, drooping; outer segments white, inner tipped with green and shorter.

Scattered, probably always the result of cultivation.

1865. Feb. 20.	1869. Jan. 11.	1873. Jan. 8, 24.
1866. full Feb. 10.	1870. Feb. 11.	1874. Jan. 17, 26.
1867. Feb. 6.	1871. Feb. 10.	1875. Jan. 15.
1868. Feb. 16. (cult.) Feb. 8.	1872. Jan 21.	1876. Jan. 30. (cult.) Jan. 28

71. ALISMACEÆ.

Water plants; perianth of six leaves, the three inner always petal-like the three outer sometimes small and sepal-like; carpels three, six, or many, always distinct or ultimately separable.

Perianth segments all coloured; flowers in a large terminal umbel ... ... 3. Butomus.

Perianth segments, 3 small and green, 3 larger and coloured.

Leaves sagittate ... ... 2. Sagittaria.

Leaves ovate ... ... 1. Alisma.

Perianth segments all small and slightly coloured; leaves linear ... ... 4. Triglochin.

1. Alisma Linn.

1. A. Plantago Linn. *Water Plantain*

Bab. 349. Hook. 367. Benth. 445.

By water. P. June to September.

Base of the stem swollen, fleshy; leaves all radical, large, ovate lanceolate, on long stalks; submersed leaves linear; flower stalks two to three feet high, branched, whorled, the whole forming a loose pyramidal panicle; flowers rather small, the three outer perianth segments small and green, the three inner pale lilac and larger; carpels from twenty to thirty, arranged in a circle.

Common.

1865. June 24.	1869. June 19.	1873. July 8.
1866. Coming into fl. Aug. 22.	1870. June 17.	1874. July 4.
1867. ———	1871. ———	1875. July 1.
1868. June 2.	1872. June 15.	1876. June 27.

2. Sagittaria Linn.

1. S. sagittifolia Linn. *Arrowhead.*

Bab. 349. Hook. 368. Benth. 444.

Ditches and rivers. P. July.

Base of the stem swollen, stoloniferous, "each runner ending in a tuber," leaves all radical on long 3-angled stalks, those rising above the water arrowshaped, with the 3 parts nearly equal, those under the water being nothing but flattened leaf-stalks; flower stalks 6 to 18 inches high, with about 5 distant whorls of from 3 to 5 flowers in each, the uppermost, males on stalks from ½ to 1 inch long, the lower, females, on shorter stalks; 3 outer segments of the perianth green, ovate, 3 inner twice as long, thin, white with a purple base; carpels very numerous.

Scarce. Occurs in the Canal at Wilcot.

1870. July 7.	1874. full July 4.
1872. June 15.	1876. July 5.

3. Butomus Linn.

1. B. umbellatus Linn. *Flowering Rush.*

Bab. 350. Hook 369. Benth 444.

Rivers and ditches. P. July to Sep.

Rootstock creeping, throwing up numerous 3-angled leaves more or less twisted above, and expanded at the base so as to embrace the rhizome: flower stalks radical, from 2 to 4 feet high, exceeding the leaves, terminated by a

large umbel with 3 membraneous bracts at its base; flowers from ¼ to 1 inch across—perianth of 6 leaves, deep rose colour along the centre but pale towards the edges: stamens 9; corpels 6, tapering, with numerous seeds in each.

Scarce.

I.—Preshute Water Meadows, *J. W. Mills*; Canal at Wilcot, *Rev. J. Sowerby*; River near the College, *S. F. Townsend.*

III.—Mildenhall Water Meadows; Ramsbury.

1870. June 28.

1876. by July 5.

4. Triglochin Linn.

1. T. palustre Linn. *Arrow-grass.*

Bab. 350. Hook. 368. Benth. 447.

Marshy places. P. June to Aug.

Stems slightly swollen at the base, emitting a few creeping runners; leaves linear, slender, rather succulent, about 6 or 8 inches in length; flower stalk taller, increasing in length to about 2 feet, its upper half bearing a spike of small greenish yellow flowers; perianth of 6 divisions green edged with purple; anthers purple; carpels 3, stigmas feathery; fruit adpressed to the scape on short stalks, and when ripe separating from below upwards into 3 carpels, leaving a central axis.

Scarce.

I.—New Mill; Huish, *Rev. J. Sowerby.*

III.—Mildenhall.

72. ASPARAGACEÆ.

The two Marlborough species belong to two genera, very different in appearance.

A low shrub with broad dark green stiff "leaves" (really flattened branches) ... ... 2. Ruscus.

A herb with solitary stems and large ovate leaves 1. Polygonatum.

1. Polygonatum Tourn.

1. P. multiflorum All. *Solomon's Seal.*

Bab. 352. Hook. 379. Benth. 473.

Woods. P. May, June.

Rootstock thick, horizontal, with circular scars, the markings of previous stems; stem round, from 2 to 4 feet high and bent to one side, with numerous alternate leaves, all turning to one side, with the flowers hanging from the lower side of the stem, away from the leaves; leaves 3 or 4 inches long, ovate, clasping the stem; flowers bell-shaped, from 2 to 7 or 8 together on branching stalks; corolla contracted about the middle, 6-cleft, white with the tips of the lobes green; filaments hairy; berry dark blue.

Common.

1865. May 13.	1869. Ap. 29.	1873. May 17, 22.
1866. May 21.	1870. May 12.	1874. May 5.
1867. May 13.	1871. May 4, 12.	1875. May 10.
1868. May 2.	1872. May 20.	1876. June 6.

2. Ruscus Linn.

1. R. aculeatus Linn. *Butcher's Broom.*

Bab. 352. Hook. 378. Benth. 475.

Hedges. Sh. Nov. or Dec. to June.

Rootstock creeping; stems rigid numerous, branched, from 2 to 3 feet high, with very stiff ovate, sharply pointed leaves (which are really flattened branches) called *cladodes*; the real leaves very minute from the axils of which these cladodes spring; flowers dicœcious, situated in the middle of these cladodes, really on the upper surface, but from a twist apparently on the under surface, these flowers are really stalked, the stalk being very visible and adherent to the cladode; perianth of 6 divisions, the 3 outer ovate, the 3 inner very narrow, all green; filaments united into a tube on the top of which the 3 anthers are placed; ovary 3-celled, dark purple; fruit a scarlet berry, bracts minute; the males on narrower cladodes than the females.

Planted in one or two hedges. Very scarce.

A few flowers may be found expanded almost throughout the winter.

73 LILIACEÆ.

Rootstock bulbous; perianth petaloid, inferior.

Stem leafy.

Flowers solitary ... ... 1. Tulipa.

Flowers in umbels or heads ... ... 3. Allium.

Stem leafless.

Flowers in flat-topped corymbs	2. Ornithogalum.
Flowers in umbels	3. Allium.
Flowers in racemes	4. Endymion.

1. Tulipa Linn.

1. T. sylvestris Linn. *Tulip.*

Bab. 353. Hook. 385. Benth. 476.

An escape. P. April, May.

Bulb producing a new bulb within its coats and throwing out a stolon, at the extremity of which an offset is produced; stem with 2 or 3 leaves: flowers terminal, large yellow, nodding in bud; perianth segments without any depression at the base, oval, acute, the three inner rather larger; filaments hairy at the base.

An escape. It has been found in a field near Martinsell; at Honeystreet by *C. A. Sladen*; Ramsbury, *Miss Meyrick*.

2. Ornithogalum Linn.

1. O. umbellatum Linn. *Star of Bethlehem.*

Bab. 354. Hook. 382. Benth. 477.

An escape. P. May June.

Leaves long, linear, concave, with a white stripe; flower stalk 8 to 12 inches high; flowers in a raceme with the lower stalks so lengthened as to bring all the flowers on a level with one another, each partial stalk with a long membranous bract at its base; flowers large, perianth segments 6, white with a broad stripe of green outside.

Probably always an escape; first field on the way to the station after leaving Pewsey Road, *F. Bonney*; field at Manton, *H. K. Ward*; near Martinsell; New Mill; West Woods, *F. E. Thompson, Esq.*; Preshute, *A. E. Townsend*; Alton, *C. A. Sladen*; Axford, *Rev. C. E. Thorpe*.

3. Allium Linn.

We have but two species about Marlborough, differing very much in appearance. Strictly speaking the leaves are all radical, but in some species the lower part forms a sheath to the stem, so that the stem appears to be

leafy; the perianth is divided into 6 segments, either spreading or bell shaped; stamens 6, either all similar, or the 3 alternate ones with a broad filament, terminating in 3 points, the central one alone bearing an anther. In some species the flowers are replaced by small bulbs, called head-bulbs or bulbules.

Leaves broad, flowers white... ... ... 2. ursinum.
Leaves narrow, cylindrical, flowers pinkish, or flowers all or mostly replaced by bulbules ... ... 1. vineale.

1. **A. vineale** Linn. *Crow Garlic.*

Bab. 356. Hook. 382. Benth. 482.

Waste ground and dry fields. P. July.

Whole plant smelling rather strongly. Stems from 1 to 2 feet high, simple, clothed about half way up with the sheaths of the leaves, which have quite withered by the time of flowering; flowers usually replaced by a dense head of bulbules with a membranous bract below, when it is the var. *β. A. compactum* Thuil.; more rarely amongst the bulbules are a few flowers on rather long stalks; flowers bell-shaped, perianth segments pinkish, with green keels; stamens 6, the 3 alternate ones broad and 3-pointed, this is the variety *A. capsuliferum* Syme.

Var. *β.* not common; the form *capsuliferum* has been found only once near Marlborough by *G. F. Ruck.*

I.—Cadley, *J. J. Pulleine*; New Mill.

II.—Folly Farm.

III.—Rabley; Mildenhall.

IV.—Row Down, *A. Busk*; Barton Farm, *S. F. Townsend.*

2. **A. ursinum** Linn. *Ramsons.*

Bab. 358. Hook. 384. Benth. 482.

Damp woods and hedges. P. May, June.

Whole plant very fetid; leaves all radical, blade from two to five inches long, oval, on long stalks; flower stalk from six inches to one foot high, naked, terminated by an umbel of white flowers, with a rather large two valved membranous bract at its base; flowers conspicuous,; perianth segments broadly lanceolate, stamens all similar.

Not common.

Wan's Dyke where it crosses the Pewsey Road; Woodborough, *Rev. J. Sowerby*; Chisbury, *Rev. C. E. Thorpe*; Mildenhall, *Rev C. Soames*; Binck Knoll.

1865. (cult.) Ap. 25. by May 20.	1869. (cult.) May 11. full, May 22.	1873. May 6.
1866. (cult.) May 12.	1870. (cult.) May 13, full May 20.	1874. May 1.
1867. (cult.) May 12, May 10.	1871. May 2.	1875. May 12.
1868. April 30.	1872. May 8.	1876. May 15.

4. Endymion Dumort.

1. E. nutans Dum. *Blue Bell.*

Bab. 358. Hook. 381. (*Scilla nutans*). Benth. 479. (*Scilla*).

Woods and thickets. P. April to June.

Leaves linear, grassy, rather succulent; flower stalk longer than the leaves, simple, terminated by a raceme of drooping deep-blue flowers, each with a blue bract at its base; flowers bell-shaped, almost tubular, sweet scented; perianth segments 6, distinct; stamens 6 united to the perianth segments half way up.

Flowers sometimes white or pink.

Very common.

1865. Ap. 16.	1869. Ap. 9.	1873. Ap. 17.
1866. Mch. 30, Ap. 13.	1870. Ap. 22.	1874. Ap. 4.
1867. Ap. 9.	1871. Ap. 14, 24.	1875. Ap. 8.
1868. Ap. 5.	1872. Mch. 31.	1876. Ap. 16.

74. MELANTHACEÆ.

The only Marlborough representative of this order is—

1. Colchicum Linn.

1. C. autumnale Linn. *Meadow Saffron.*

Bab. 359. Hook. 386. Benth. 484.

Woods and meadows. P. Aug. to Oct.

Flower very like the crocus in appearance, but differing in the position of the ovary, which is above the perianth in this species but below it or rather adherent to it in *Crocus*. At the time of flowering in the autumn, the flower alone appears above ground, the ovary being still within the bulb 3 or 4 inches at least below the ground; the tube of the perianth is consequently

of considerable length and terminates 3 or 4 inches above ground in 6 light purple ovate segments; stamens 6; styles 3, very long; in the following spring the leaves appear; these are about 8 or 10 inches long and 1 inch or more broad; finally the capsule appears above ground, soon after which the leaves wither away.

Common in districts, 1 and 2.

75. JUNCACEÆ.

Herbs with stiff round or flat and grass-like leaves, and small herbaceous or dry flowers. Perianth regular, dry and calyx-like, of 6 segments. Stamens 6 (rarely 3); style 1, stigmas 3. The order might, from the consistence of the perianth, be rather placed among the *glumiferæ*, were it not for the whorled arrangement of the segments.

Capsule 3 celled, seeds many; leaves mostly not flat	1. Juncus.
Capsule 1 celled, seeds 3, leaves flat and grassy	2. Luzula.

1. Juncus Linn.

Some of the species are very difficult to discriminate, and in fact the 8 Marlborough Species are often reduced to 4 or 5. In using the following table it will be well to bear in mind that a single character is not sufficient to define a species, and therefore that the detailed descriptions had better be studied ere deciding upon the species.

Leaves reduced to sheaths.	
Stems soft, faintly striate	1. effusus. and 2. conglomeratus.
Stems rigid, pith interrupted	3. glaucus.
pith continuous	4. diffusus.
Stems leafy, and with the leaves hollow, but with partitions, giving a jointed appearance when dry.	
Stems round, perianth as long as capsule ...	5. obtusiflorus.
Stems compressed, perianth shorter than capsule.	
Inner segments of perianth longer ...	6. acutiflorus.
Segments all equal	7. lamprocarpus.
Leaves channelled, flowers solitary	8. bufonius.

1. J. effusus Linn. *Soft Rush.*

Bab. 360. Hook. 388. (*J. communis*) Benth. 486. (*J. communis*).

Marshy ground. P. July.

Rootstock creeping; stems 2 or 3 feet high, leafless, clothed below with a few brown scales, soft, faintly striate; pith continuous; some stems are barren, others have a panicle of flowers at the summit, which appears to be on one side at some distance from the top in consequence of the lowest bract resembling a continuation of the stem; panicle of flowers generally lax, sometimes compact; segments of perianth lanceolate, longer than the capsule; capsule not pointed, but presenting a small depression when the style is rubbed off.

Common.

2. J. conglomeratus Linn. *Common Rush.*

Bab. 361. Hook. 388. (*J. communis*). Benth. 486. (*Juncus communis*).

Wet places. P. July.

Very similar to the last, with which it is often united, but differing in the segments of the perianth being tinged with brown, the capsule rather smaller and ending in a distinct point, and the panicle being generally compact, not diffuse. According to Syme *effusus* is rather later in ripening its capsules.

Common.

3. J. glaucus Sibth. *Hard Rush.*

Bab. 361. Hook. 388. Benth. 486.

Wet places. P. July.

Rootstock creeping; stems not so tall as in *J. effusus*, to which it is similar in many respects; the stems, though thinner, are much more rigid, deeply striate, and with the pith interrupted; the diffuse panicle of flowers is nearer the summit; perianth brown, the segments narrow lanceolate, rather longer than the capsule, which is dark chestnut and gradually contracted into a point.

Common.

4. J. diffusus Hoppe.

Bab. 361. Hook. 388. Benth. 486 (*J. Glaucus.*)

Wet places. P. July.

Considered by Watson as a sterile variety of *J. effusus*, but by Hooker and Syme as a hybrid between *J. glaucus* and *J. effusus*. Bentham does not notice it at all.

Very like *glaucus*, but the stem is green (not glaucous) less striate, and pith not interruped, the capsule is also smaller, and the seeds always imperfect.

I believe I have met with this occasionally, but have no specimens by me.

5. J. obtusiflorus Ehrh.

Bab. 362. Hook. 391. Benth. 487.

Marshes. P. July to Sep.

Stem from 2 to 3 feet high, erect, round; leaves few; segments of the perianth pale, often purplish, quite blunt, as long as the acute, pale brown capsule. Flowers numerous, in clusters of 3 to 8, arranged in a much branched panicle, the lower branches much longer than the foliaceous bract.

Has been found at Wilcot.

6. J. acutiflorus Ehrh.

Bab. 363. Hook. 391. (*J. articulatus*). Benth 487. (*J. articulatus*)

Wet places. P. June to August.

Rootstock creeping; stem from 1 to 2 feet high with from 3 to 4 leaves, rather compressed and internally jointed; segments of the perianth acute, the inner ones longest, all rather shorter than the capsule, which is pale brown narrowed gradually at the tip; flowers in clusters of 5 or 6 arranged in a branched panicle, the lowest branches commonly longer than the foliaceous bract.

Not uncommon.

7. J. lamprocarpus Ehrh. *Jointed Rush.*

Bab.363. Hook. 391. Benth. 487. (*J. articulatus*).

Boggy places. P. July to Sep.

Stem compressed 12 to 18 inches high, with from 6 to 8 compressed, internally jointed leaves; segments of the perianth equal, shorter than the dark brown, pointed, capsule, outer ones acute, inner blunt, with a pale membranous margin of variable width; flowers in a terminal branched panicle, the lower branches generally longer than the leafy bract.

This is often considered to be a sub-species or variety of *acutiflorus*.

Common.

8. J. bufonius Linn. *Toad Rush.*

Bab. 364. Hook. 391. Benth. 488.

Wet places. A. July, Aug.

A small tufted annual, with numerous leafy forked stems, from 1 or 2 to even 10 or 12 inches high: leaves very slender, pale green; flowers solitary or rarely 2 or three together, along the branches; segments of perianth very unequal, narrow, acute, with membranous edges, exceeding the blunt capsule. Usually with only one leaf on a stem.

Not common. Draycot; Wolf Hall; Mildenhall; Binck-Knoll; Martinsell, *J. W. Mills*; Poulton, *W. Mansell, Esq.*, Elcott Mill, *E. F. im Thurn*; Axford.

2. Luzula D.C.

Well distinguished from Juncus by its broad, grass-like leaves, more or less fringed with hairs and its 1-celled ovary, with only 3 seeds.

Flowers in a loose panicle, one on each pedicel ... ... 1 pilosa.

Flowers in compact heads.

Stem 4 to 6 inches high, anthers 6 times as long as the filaments ... ... 2 campestris.

Stem 8 to 20 inches high, anthers not twice as long 3 multiflora.

1. L. pilosa Wild. *Hairy Wood-Rush.*

Bab. 365. Hook. 392. Benth. 490.

Woods and Thickets. P. March to May.

Rootstock tufted, with creeping offsets; stems many about 6 inches high; leaves chiefly radical or near the base of the stem, fringed with long white hairs; flowers in a loose panicle generally one on each stalk, the central one nearly sessile.

Common.

1865. seed Ap. 29.	1869. March 25.	1873. Ap. 1.
1866. Ap. 4.	1870. Ap. 11.	1874. Ap. 5.
1867. Ap. 8.	1871. March 15.	1875. Mch. 27.
1868. Mch. 16.	1872. Mch. 2.	1876. Mch. 30.

2. L. campestris Wild. *Field Wood Rush.*

Bab. 365. Hook. 393. Benth. 491.

Pastures and dry places. P. March to June.

Stem not tufted, with rather long offsets; stems from four to six inches high, solitary or few, appearing at the same time; leaves narrow, hairy; panicle of three or four dense ovate sessile or stalked clusters; filament much shorter than the anthers.

Very common.

1865.	April 14.	1869.	April 2.	1873.	April 3.
1866.	April 30.	1870.	April 19.	1874.	March 26.
1867.	April 13.	1871.	April 4.	1875.	full May 3.
1868.	April 6.	1872.	March 12.	1876.	April 6.

3. L. multiflora Lej.

Bab. 365. Hook. 393. Benth. 491.
(var. *congesta* of *L. campestris*) (*L. campestris*).

Wet and turfy places. P. May, June.

Stems tufted, with very short offsets; stems from eight to twenty inches high, many, appearing one after the other all through the summer; a larger and stouter plant than the last, the clusters of flowers denser and more numerous, the perianth leaves narrower, and the filaments much longer.

Considered by Hooker as a variety of the former, and utterly ignored by Bentham.

76. TYPHACEÆ.

Aquatics with long linear leaves; flowers monœcious, in dense spikes or globular clusters; perianth represented by membranous scales or hairs.

Flowers in spikes, long, dense, cylindrical ... ... 1. Typha.
Flowers in globose heads ... ... 2. Sparganium.

1. Typha Linn.

1. T. latifolia *Bulrush, Reed Mace.*

Bab. 367. Hook. 397. Benth. 433.
Ponds, &c. P. June, July.

Rootstock shortly creeping; stems from six to seven feet high; leaves still longer, broad, flat, sheathing at the base; spikes very long, one foot or more, the upper male portion yellow from the numerous anthers, the lower dark brown from the tufts of hairs in which the minute ovaries are enveloped, and which is placed close to, or at a very short distance from the male portion.

Scarce. Axford; Savernake, *Rev. J. Sowerby.*

2. Sparganium Linn.

Flowers in globose heads, placed at a distance from one another along the stem, with a long bract below the lower ones; upper heads all males.

Inflorescence branched, each branch bearing more than 1 head 1. ramosum.
Inflorescence simple ... ... 2. simplex.

1. S. ramosum Huds. *Branched Bur-Reed.*

Bab. 367. Hook. 396. Benth. 434.

Ditches. P. June to September.

Root sending out shoots; stem from two to three feet high, erect, branched above, lower branches with several heads, from one to three female, the rest male; radical leaves triangular at the base, exceeding the inflorescence; stem leaves flat from a sheathing base.

Common.

1865. nearly out, June 24.	1873. July 17.	1876. July 5.
1870. June 17.	1874. June 12.	
1871. May 26.	1875. June 26.	

2. S. simplex Huds. *Upright Bur-Reed.*

Bab. 368. Hook. 397. Benth. 434.

Ditches. P. July, August.

A smaller plant than the last; the stem (one to two feet high), unbranched, the globular heads at intervals, barren sessile, fertile shortly stalked, except the lowest, which is on a stalk from one to two inches in length; leaves sometimes floating, and not triangular at the base, in which state it never produces flowers (Syme).

Not uncommon.

1865. June 25.	1873. July 19.	1875. July 3
1870. July 8.	1874. July 4.	1876. ——

77. ARACEÆ.

1. Arum Linn.

1. A. maculatum Linn. *Cuckoo-Pint.*

Bab. 369. Hook. 394. Benth. 435.

Hedgebanks and thickets. P. April, May.

Rootstock tuberous; leaves all radical on long stalks, sheathing at the base, sagittate with the apex rounded or blunt, often spotted with purple; perianth none, the flowers situated in rings round a central stalk (or *spadix*)

expanding above into a club-shaped mass of a dull purple colour; the lowermost ring is formed of ovaries, above it is a ring of stamens, and above that a ring of filaments, probably abortive pistils; covering the whole inflorescence is a large bract (or *spathe*) entirely enveloping the flowers, above which it is contracted, but then expands again and opens exposing the purple spadix to view, after fructification the whole plant withers except the stem with a number of scarlet berries at the top.

Very common.

1865. Ap. 26.	1869. Ap. 18.	1873. Ap. 20.
1866. Ap. 19.	1870. Ap. 16 (not open)	1874. Ap. 21.
1867. Ap. 23.	1871. Ap. 20.	1875. full, May 3.
1868. Ap. 10.	1872. Ap. 12.	1876. Ap. 26 (not open), May 5.

78. LEMNACEÆ.

Floating plants without any distinct stem or real leaves, consisting of small leaf-like *fronds*, united two or three together by their edges, and sending out root fibres below. Flowers very minute, monœcious, 2 in a spathe; stamens 1 or 2; ovary 1-celled. Flowers very rare.

1. Lemna Linn.

Roots in a cluster beneath each frond	4. polyrrhiza.
Roots solitary.	
Fronds thin ovate, tailed at one end, with the young fronds projecting at right angles ...	1. trisulca.
Fronds broadly ovate, nearly flat beneath ...	2. minor.
hemispherical and spongy beneath ...	3. gibba.

1. L. trisulca Linn. *Ivy-leaved Duckweed.*

Bab. 370. Hook. 395. Benth. 436.

Stagnant water. A. June.

Fronds wholly submerged, thin, translucent, ovate, ending in a long slender tail at one end, and serrated at the other—from each side is produced another frond, which becomes ultimately attached to its parent by a tail and so on, very unlike the other species of the genus.

Rare. Pond at Chilton, and at Crofton, *Rev. J. Sowerby*.

2. L. minor. *Duckweed.*

Bab. 370. Hook. 395. Benth. 437.

Stagnant water. A. June, July.

Fronds rather thick, broadly ovate, entire with a single rootlet below: united 2 or 3 together by their edges.

Very common.

3. L. gibba Linn. *Gibbous Duckweed.*

Bab. 370. Hook. 395. Benth. 437.

Stagnant water. A. June to Aug.

Very similar to the last, but rather larger; hemispherical, very spongy and cellular beneath.

Scarce. Wilcot and New Mill.

4. L. polyrrhiza Linn. *Greater Duckweed.*

Bab. 370. Hook. 395. Benth. 437.

Stagnant water, rivers, canals, &c. A.

Much larger than *L. minor*, green above, purple beneath, with a tuft of roots beneath. Flowers have only once been observed, never in Britain.

79. POTAMOGETONACEÆ.

Aquatic herbs, generally entirely submersed, with long forked stems: leaves alternate, rarely opposite, either long stalked and sheathing at the base, or with a membranous stipule generally sheathing. Perianth of 4 scale-like segments, stamens 4, ovaries 4; fruit a hard dry nut. The genus *Zannichellia*, included in this Order by Babington, has monœcious flowers without a perianth, sessile in the axils of the leaves, whilst in *Potamogeton* the flowers are in spikes, elevated above the water.

1. POTAMOGETON.

Leaves alternate.

Upper leaves floating ... ... 1. natans.

Leaves all submersed.

Leaves membranous, broad

Leaves clasping the stem ... ... 8. perfoliatus.

Leaves sessile or nearly so.
Leaves broad, not curled on the edges 2. lucens.
Leaves linear oblong, edges curled 4. crispus.
Leaves alternate, linear, stipules free... ... 5. mucronatus.
,, sheathing ... ... 6. pectinatus.
Leaves opposite, submersed, stipules none ... ... 7. densus.

1. P. natans Linn. *Broad Pondweed.*
Bab. 371. Hook. 370. Benth. 441.
Ponds, ditches, and slow streams. P. June, July.
Leaves all stalked, the uppermost floating on the surface of the water, leathery. Spike dense, often an inch long or more.
Common.

2. P. lucens Linn. *Shining Pondweed.*
Bab. 373. Hook. 372. Benth. 441.
Deep water. P. June.
Leaves all submersed, large, thin, minutely toothed, suddenly contracted near the top, sometimes so much so that the midrib assumes the appearance of a spine; stipules with 2 prominent wings; flower-stalk swelling upwards.
In the Canal.

3. P. perfoliatus Linn. *Perfoliate Pondweed.*
Bab. 374. Hook. 372. Benth. 442.
Streams. P. June, July.
Leaves all submersed, thin, ovate, clasping the round stem; stipules soon disappearing; spike about ½ an inch long, on a long peduncle.
In the Canal and various parts of the Kennet.

4. P. crispus Linn. *Water Caltrops. Frog's Lettuce.*
Bab. 374. Hook. 372. Benth. 442.
Ditches and streams. P. May, June.
Stem compressed; leaves all submersed, long and rather narrow with waved edges; spikes small, of about 3 to 6 flowers.
Not uncommon.

5. P. mucronatus Schrad.
Bab. 375. Hook. 374. Benth.
(*P. pusillus* var.)
Ditches. P. June, July.

Stem slightly compressed; leaves linear 5 veined, suddenly contracted into a short point; spikes short, lax, about half as long as the stalk.

Canal at Wilcot.

6. P. pectinatus Linn.

Bab. 376. Hook. 374. Benth. 443.

Ponds and streams. P. June, July.

Leaves formed of two interrupted tubes, lower leaves linear, flattened, slightly grooved above, upper hair-like. Spike rather interrupted, about an inch long, on stalks about 3 times as long.

In the Canal.

7. P. densus Linn. *Small Water Caltrops.*

Bab. 376. Hook. 373. Benth. 442.

Ditches. P. May, June.

Leaves all submersed, thin, broadly lanceolate, clasping the stem, rather crowded. Spike few flowered, from 2 to 6, on a rather short stalk, turned down after flowering.

In the Canal, and in ditches near; also in the Kennet at Mildenhall.

2. Zannichellia Linn.

1. Z. palustris Linn. *Horned Pondweed.*

Bab. 377. Hook. 375. Benth. 439.

Stagnant water. A. or P. May to Aug.

Stem floating branched, slender. Leaves very slender, opposite; flowers monœcious, axillary, sessile. The male flower consists of single stamen, and the female of about 4 carpels, often in the same axil; style half as long as the fruit.

Has been found at Manton; in a pond beside the Hungerford road in Savernake Forest, but it is nine years since it has been found there; and in a pond near Rabley Copse.

DIVISION III.—GLUMIFERÆ.

Floral envelopes bract-like, imbricated.

The general structure of the flowers in this division is as follows; the perianth is either wanting or replaced by a few bristles or scales, and the flower itself therefore consists of an ovary and stamens (if unisexual of

course of only one of these and sometimes rudiments of the other); each flower is placed in the axil of a scale (or *glume*), arranged on a common axis, the whole forming a little spike or *spikelet*. Each spikelet again is placed on the axil of another scale-like or leafy *outer bract*.

There are only two Orders in this Division.

Leaves with entire sheaths, anthers entire at the ends, stems usually solid, stigmas not feathery	80. Cyperaceæ.
Leaves with split sheaths, anthers notched at both ends, stems usually hollow, stigmas feathery	81. Gramineæ.

80. CYPERACEÆ.

Flowers perfect.

Bristles scarcely exceeding the glume or wanting.	
Base of the style not dilated	1. Eleocharis.
Base of the style dilated	2. Scirpus.
Bristles ultimately much exceeding the glumes	3. Eriophorum.
Flowers unisexual	4. Carex.

These genera only are represented near Marlborough. *Eleocharis* is often united with *Scirpus*.

1. Eleocharis R. Br.

1. **E. palustris** R. Br. *Creeping Spike-rush.*

Bab. 381. Hook. 401. Benth. 498. (*Scirpus.*)

Wet and marshy places. P. June to Aug.

Rootstock extensively creeping with numerous erect stems, very like those of a rush, leafless except one or two short sheaths at their base, from 6 to 12 inches high; spikelet terminal, one or two lowest glumes empty, the lowest glume half surrounding the spike.

Very common.

1865. by June 18.	1869. May 27.	1873. June 10.
1866. ———	1870. full May 28.	1874. May 30 (Chilton)
1867. June 12.	1871. May 26.	1875. May 22.
1868. May 19.	1872. by May 30.	1876. June 23.

2. Scirpus Linn.

The two species yet detected about Marlborough are very different in appearance.

Stems 3 to 6 inches long, spike solitary terminal	2. cæspitosus.
Stems 4 to 6 feet high, spikes in a compound panicle	1. lacustris.

1. S. lacustris Linn. *Bulrush.*

Bab. 382. Hook. 399. Benth. 501.

Rivers and ponds. P. June, July.

Rootstock creeping extensively; stems stout, erect, 4 to 6 feet high, with 1 or 2 long sheaths at the base. Spikes in a terminal branched panicle with a long bract below, prolonged so as to make it appear a continuation of the stem: glumes brown, fringed at the edge, notched at the top; spikes ovoid, the central ones sessile.

In the Kennet between Mildenhall and Axford.

2. S. cæspitosus Linn. *Tufted Spike-rush.*

Bab. 383. Hook. 402. (*Eleocharis*). Benth 490.

Heaths. P. May, June.

Tufted; stems 3 to 6 inches long, erect, striate, with many leafless acute sheaths, the outer ones brown, the inner green with narrow leafy tips; spikelets solitary, terminal, few flowered, two outer glumes as long as the spike, enclosing it, and ending in long rigid leaflike points; bristles about 6; many of the stems barren.

Chilton Foliatt.

3. Eriophorum Linn.

1. E. polystachion Linn. *Cotton-Grass.*

Bab. 385. Hook. 403. Benth. 502.

Bogs. P. May, June.

Stem nearly round, about a foot high; leaves few, mostly radical, smooth, linear, channelled below, their upper half triangular. Spikes from 4—12, in a terminal umbel, the inner ones sessile, the outer stalked and drooping, the 2 or 3 outer bracts more or less leafy: glumes lead coloured, ovate, membranous; bristles very numerous, increasing much in length, forming dense cottony tufts.

Chilton Foliatt.

4. Carex Linn.

Herbs with grass-like leaves, and solid triangular stems; leaves mostly radical or on the lower part of the stem. Spikelets solitary, or in spikes, or these again in compound panicles; flowers unisexual, the stamens and pistils always in separate glumes, either in separate spikelets, or in different parts of the same spikelet. Stamens 3, rarely 2; ovary enclosed in a bottled-shaped sack, contracted at the top through which the 2 or 3 cleft style protrudes.

A very extensive genus, the Marlborough representatives of which may be thus tabulated.

- Spike simple, solitary, terminal ... ... 1. pulicaris.
- Spike compound (*i.e.*,) the spikelets arranged in spikes, and these spikes again arranged in other spikes or panicles).
  - Male and female flowers intermixed:
    - Spikes panicled.
      - Stems 2 to 3 feet high, in dense tufts ... 6. paniculata.
      - Stems 1 to 2 feet high, creeping ... ... 2. disticha.
    - Spikes crowded or interrupted.
      - Spike entirely compound, stem stout, very triangular ... ... 3. vulpina.
      - Spike simple above, compound below ... 4. muricata.
    - Spikes distant.
      - Bracts very long ... ... 7. remota.
      - Bracts short ... ... 5. divulsa.
  - Terminal, 1 or rarely 2 spikes entirely male.
    - Fertile spikes very long, pendulous ... ... 9. pendula.
    - Fertile spikes cylindrical, the lower at least on pendulous stalks.
      - Spike compact, brown ... ... 11. glauca.
      - Spike lax, green ... ... 13. sylvatica.
    - Fertile spikes cylindrical, erect.
      - Bracts very long, fruit hairy .. ... 14. hirta.
      - Bracts not longer than the spike, fruit glabrous 8. panicea.
    - Fertile spikes oval.
      - Spikes dark brown ... ... 10. praecox.
      - Spikes yellowish green ... ... 12. flava.
  - Male spikes many, terminal.
    - Fruit inflated ... ... 15. ampullacea.
    - Fruit not inflated.
      - Glumes of the barren spikes blunt ... 16. paludosa.
      - Glumes of the barren spikes acute ... 17. riparia.

Carex ovalis, pilulifera, and *vesicaria* have been reported as having been found, but I am not certain as to the correctness, and have therefore omitted them.

1. C. pulicaris Linn. *Flea Sedge.*

Bab. 386. Hook. 406. Benth. 506.

Bogs. P. June.

Tufted; three to eight inches high, smooth; leaves very slender, sometimes exceeding the stem; upper half of spike male; fruit dark brown, at length deflexed.

Rare. Bedwyn; Axford.

2. C. disticha Huds.

Bab. 387. Hook. 407. Benth. 510.

(*C. arenaria* var.)

Bogs. P. May, June.

Creeping; one to two feet high, with rough angles; leaves rather narrow, channelled; spikelets crowded into a terminal spike, the two or three lower ones with a short bract, the upper and lower ones fertile, the intermediate mostly male; glumes brown.

Not uncommon, but principally in III. Woodborough, *Rev. J. Sowerby;* Elcot Mill; Poulton; Axford; Chilton Foliatt.

3. C. vulpina Linn. *Great Rough Sedge.*

Bab. 388. Hook. 409. Benth. 509.

Wet places. P. June.

Tufted; about two feet high, strongly triangular, with rough angles; leaves broad; spikelets crowded into a terminal spike, often rather interrupted below, the lower ones with small slender bracts; glumes pale brown, with a green midrib, produced into a short awn; fruit palish green.

Not uncommon.

4. C. muricata Linn. *Prickly Sedge.*

Bab. 388. Hook. 408. Benth. 509.

Gravelly pastures. P. June.

Tufted; one to two feet high, wiry, triangular, with rough angles; leaves narrow; spikelets crowded above, rather interrupted below, the lowest with a slender bract, generally shorter than the spikelet; glumes pale green; in flower the spikes are rather similar to that of the last, only not so compound and greener; in fruit, from the upper (male) half falling away, it almost presents the appearance of a simple spike.

Common.

5. C. divulsa Good. *Grey Sedge.*

Bab. 388. Hook. 409. Benth. 510. (*C. muricata*).

Moist shady places. P. June.

Very similar to the last, of which it is often considered but a variety, or at most a sub-species; the spikelets are more distant, the stem curved, flaccid, glumes paler, and the top of the fruit less rough.

Common.

6. C. paniculata Linn.

Bab. 389. Hook. 408. Benth. 509.

Bogs, edges of streams and ponds. P. June.

Densely tufted, and generally elevated stems from two to four feet high, triangular, leaves rather broad; spikes generally very compound, forming a large panicle, but it is very variable, and is sometimes reduced even to a simple spike; glumes brown; bracts shorter than the spike.

Common.

7. C. remota Linn.

Bab. 390. Hook. 409. Benth. 508.

Damp places. P. June.

Tufted; 1 to 2 feet high, bluntly triangular; leaves narrow, channelled; spikelets crowded in the upper part of the stem, but very distant below; glumes greenish white; lowermost bracts very long, uppermost short.

Not common.

8. C. panicea Linn. *Carnation-grass.*

Bab. 394. Hook. 414. Benth. 516.

Marshy places. P. June.

Tufted and creeping; 1 to 2 feet high, erect, smooth; leaves glaucous, flat; terminal spike male; fertile spikes lax, erect, remote, stalked; glumes dark brown with a green keel and membranous margins; bract leaf-like, sheathing the stem at their bases, lowermost about as long as its spike, the rest shorter.

Uncommon.

9. C. pendula Huds. *Pendulous Sedge.*

Bab. 395. Hook. 415. Benth. 578.

Damp woods. P. May.

Tufted; from 3 to 6 feet high; leaves very broad; fertile spikes dense, often 3 or 5 inches long, drooping, sometimes with male flowers in the upper

part; glumes small, brown with a green keel and the midrib produced into a point or short awn; bracts leaf-like, lowermost with long sheaths, nearly equalling the stalks of the spikes, uppermost sheaths very short.

Binok-Knoll. Pewsey, *F. Storr, Esq.*

10. C. præcox Jacq. *Vernal Sedge.*

Bab. 396. Hook 415. Benth. 513.

Heaths and pastures. P. Ap., May.

Creeping; 3 to 6 inches high; leaves tufted, rather broad, flat; male spike terminal, rather large, female spikes short, crowded, sessile, (the lowermost often shortly stalked); glumes broad, pale brown with a green midrib, projecting beyond the glume; lowermost bract only slightly sheathing and leaflike.

Very common. The numerous yellow stamens make it conspicuous, otherwise the plant is very similar to the grass among which it grows.

1865. (Ap. 26).	1869. Ap. 20.	1873. Ap. 29.
1866. Ap. 22.	1870. May 13 ?	1874. ———
1867. Ap. 28.	1871. by May 6.	1875. May 5.
1868. by May 5.	1872. Ap. 13.	1876. May 3.

11. C. glauca Scop. *Glaucous Sedge.*

Bab. 397. Hook. 414. Benth. 517.

Meadows, pastures, open woods, &c. P. Ap., May.

Extensively creeping; 6 to 12 inches or more high, very variable; leaves very glaucous, tufted, flat, erect or recurved; male spikes terminal; female spikes dense, stalked, generally ultimately drooping; sometimes with a few male flowers at the extremity, glumes dark brown, with a greenish midrib and sometimes green margins; bracts leaflike, the lowest reaching to the top of the terminal male spike.

"A very variable plant, but easily recognised by its extensively creeping rootstock and very glaucous leaves, associated with slender stalked female spikes, short sheathing bracts, and slightly flattened fruit, more or less clothed with minute asperities, and with an extremely short entire beak." (Syme).

Very common.

1865. May 3.	1869. Ap. 20.	1873. Ap. 20.
1866. May 5.	1870. May 12.	1874. Ap. 25.
1867. May 4.	1871. Ap. 25.	1875. full May 3.
1868. Ap. 25.	1872. Ap. 15.	1876. May 6.

12. C. flava. *Yellow Sedge.*

Bab. 398. Hook. 418. Benth. 515.

Wet places. P. May, June.

Tufted; 3 to 12 inches high, smooth; leaves broad; fertile spikes usually crowded and close to the male spike, but often distant from one another and from the male spike, short, oval; glumes reddish brown with a green midrib, ultimately brownish yellow; bracts sheathing at the base, leaf-like, often overtopping the male spike.

The variety *lepidocarpa* in the form occurring in Wiltshire, it has the beak of the fruit straight instead of being curved downwards.

Chilton Foliatt.

13. C. sylvatica Huds. *Wood Sedge.*

Bab. 400. Hook. 419. Benth. 517.

Damp woods. P. May, June.

Tufted, slightly creeping; about 2 feet high, triangular, smooth; leaves rather broad, pale green; male spike solitary, terminal; female spikes lax, cylindrical, on long stalks, drooping; glumes membranous, green; bracts leaf-like, with long sheaths.

Common.

1865. by May 13.	1869. Ap. 29.	1873. May 4.
1866. May 3.	1870. May 18.	1874. May 11.
1867. May 15.	1871. May 17.	1875. May 15.
1868. Ap. 29.	1872. May 9.	1876. May 14.

14. C. hirta Linn. *Hammer Sedge.*

Bab. 401. Hook. 417. Benth. 514.

Wet places. P. May, June.

Creeping extensively; from 1 to 2 feet high, triangular, glabrous; leaves broad, green, hairy, with long sheaths; male spikes 2 or 3, crowded at the top of the stem; female spikes very distant, stalked, the stalks generally concealed by the sheaths of the leaf-like bracts, the lowermost of which especially are very long, and hairy; glumes, membranous, hairy, the green midrib extended into a short awn.

Common.

15. C. ampullacea Good. *Bottle Sedge.*

Bab. 402. Hook. 421. Benth. 518.

Very wet places. P. June.

Tufted and creeping; 1 to 2 feet high, triangular, glaucous; leaves glaucous, channelled; female spikes about 2, erect, stalked; fruit inflated, sud-

denly narrowed into a long slender beak; bracts long, leaf-like, not sheathing at the base.

Poulton; Huish.

16. C. paludosa Good. *River Sedge.*

Bab. 402. Hook. 421. Benth. 519.

Wet places. P. Ap., May.

Tufted and creeping; 2 to 3 feet high, acutely triangular and rough on the edges; leaves broad, flat, rough; male spikes large terminal, blunt; fertile spikes also large and blunt; glumes brown, blunt in the middle of the male spikes, acute in the female spikes: bracts leaf-like, not sheathing.

Common.

1865. nearly out, Ap. 23.	1869. Ap. 15.	1873. May 17.
1866. Ap. 21.	1870. May 14.	1874. Ap. 28.
1867. May 8.	1871. May 4.	1875. May 3.
1868. ———	1872. Ap. 16.	1876. May 7.

17. C. riparia Curt. *Great River Sedge.*

Bab. 402. Hook. 422. Benth. 519. (*C. paludosa*).

Wet places. P. Ap., May.

Very similar to the last, but a larger plant, stems from 3 to 4 feet high, and leaves broader; the spikes of flowers are decidedly acute and the glumes of the male flowers very acute with a green midrib; the anthers are terminated by a very distinct point, equal in length to the width of the anther, but which is wanting or very small in *paludosa*, and the beak of the fruit with much larger teeth.

Common.

1865. nearly out. Ap. 23.	1869. Ap. 8.	1873. Ap. 23.
1866. Ap. 13.	1870. May 14.	1874. Ap. 5.
1867. May 8.	1871. Ap. 25.	1875. (May 16).
1868. Ap. 22.	1872. Ap. 15,	1876. May 5.

It must be observed that the appearance of the species and especially of the flowering portion varies considerably with age, and that it is often impossible to name specimens in a young state. I have endeavoured to make use of such characters as are most distinct and most generally available, but it will be absolutely necessary to study more advanced manuals to obtain a proper insight into this order.

81. GRAMINEÆ.

Flowers almost always perfect: each flower consists of an ovary, surmounted by feathery styles, and (usually) 3 stamens, the anthers being united to the filaments by a single point in their back, so as to be capable of swinging about (styled *versatile*), and notched at both ends; the perianth (when present) represented by 2 very minute scales (called *lodicules*); the whole is protected on the outer side by a green, usually keeled, bract, and on the inner side by a thin membranous bract with 2 veins and edges turned inwards: they are called *pales* (but the outer one is often called a *glume*, the membranous one alone being called a *pale*)—these flowers are arranged in *spikelets*, having a pair of scales or *glumes* at the base, in which the flowers are arranged on each side of an axis. Many spikelets have but one perfect flower, the other flowers being wanting or represented by empty pales. The spikelets are variously arranged; they may be sessile and arranged close to one another at the top of the main stalk, forming a *spike*, or they may be stalked, and attached to the branches of the main stalk, forming what is called a *panicle*. The leaves are parallel veined, the lower part forming a sheath round the stem, and split along one side; at the point where the sheath is united to the blade is frequently a transverse membrane (or *ligule*), or a ring of hairs. This ligule is often very useful in determining the species.

From the similarity of the structure of the flowers, as well as from their minuteness, it is difficult to tabulate or arrange the species. In the following Table I have endeavoured to select such characters as are most conspicuous.

Spikelets 1-flowered, or with only one perfect flower.

Spikelets in spikes.

Glumes without awns.

Stamens 2 ... ... 2. Anthoxanthum.

Stamens 3.

Spike cylindrical, pale awned 4. Alopecurus.

Spike ovoid, no awns ... ... 1. Phalaris.

Spike one-sided, with a comb-like bract beneath each spikelet 21. Cynosurus.

Glumes awned.

Spike compressed, awns long, stamens 3 28. Hordeum.

Spike round, awns short, stamens 1 23. Festuca.

Spikelets in panicles.

Spikelets ovate.

Spikelets small, panicle much branched 5. Milium.

Spikelets large, panicle slightly branched ... ... 15. Melica.

Spikelets lanceolate.
Awns none.
Marshy plants, spikelets in a clustered panicle ... ... 1. Phalaris.
Terrestrial, spikelets in a diffuse panicle ... ... 7. Agrostis.
Pales awned.
Awns jointed ... ... 9. Aira.
Awns not jointed ... ... 7. Agrostis.
Spikelets 2 or more flowered.
Spikelets in spikes.
Glumes with their *edges* to the main stalk.
Glumes equal ... ... 27. Triticum.
Glumes unequal ... ... 26. Brachypodium.
Glumes with their *backs* to the main stalk.
Glumes 1 (or rarely a rudiment of a second) ... ... 29. Lolium.
Glumes 2 ... ... Festuca loliacea.
Spikelets panicled, in compound spikes, or in racemes.
Outer pales awned.
Awns on the *lower* half of the back of the pales.
Flowers 3 or more in a spikelet.
Fruit glabrous ... ... 10. Trisetum.
Fruit hairy at the top ... 11. Avena.
Flowers 2 in a spikelet.
Spikelets small; awn very fine scarcely projecting beyond the glumes ... 9. Aira.
Spikelets large, awn projecting 12. Arrhenatherum.
Awns terminal, or nearly so.
Pales surrounded by long hairs 6. Phragmites.
No hairs below the pales.
Awn from below the membranous edge of pale.
Lower pale with a long awn 24. Bromus.
Lower pale with a short awn 25. Serrafalcus.
Awns quite terminal.
Panicle spreading, or in a close one-sided spike ... 23. Festuca.
Panicle in dense clusters 22. Dactylis.

Outer pale of the perfect flower awnless,
of the male flower awned.
Spikelets small, awn scarcely protruding 8. Holcus.
Spikelets large, awns projecting ... 12. Arrhenatherum
Outer pales awnless.
Spikelets sessile.
Spikelets in an apparently one-sided simple spike ... ... 21. Cynosurus.
Spikelets in a cylindrical spike slightly interrupted below ... 14. Koeleria.
Spikelets stalked.
Lower pale bifid, spikelets in a raceme 13. Triodia.
Lower pale entire.
Glumes nearly equal.
Spikelets in a slightly compound raceme ... 15. Melica.
Spikelets in a loose triangular panicle ... 19. Briza.
Glumes unequal.
Tall aquatic plants ... 17. Glyceria.
Terrestrial plants.
Panicle one-sided, stiff; glumes rounded on the back ... ... 18. Sclerochloa.
Panicle scarcely one-sided, branches slender; glumes keeled, with silky hairs ... ... 16. Poa.
Lower pale, blunt at the top, glumes unequal ... ... 20. Catabrosa.

1. Phalaris Linn.

Spikelets 1-flowered; glumes equal, covering the flowers. The two species are so dissimilar that they are not unfrequently separated.

I. P. canariensis Linn. *Canary-Grass.*

Bab. 412. Hook. 429. Benth. 528.

Always an Escape. A. July.

Stems from 1 to 2 feet high, each ending in an ovoid head; glumes very broad, with a very conspicuous wing on the back, white or pale yellow with a broad green line down each side.

Hardly entitled to rank as a Marlborough species.

2. **P. arundinacea** Linn. *Reed-Grass.*

Bab. 412. Hook. 429. Benth. 528. (*Digraphis*)

By water. P. June to Aug.

Rootstock creeping; stems from 2 to 6 feet high, stout, leafy; spikelets very numerous, clustered, in a large upright panicle, spreading during flowering, but afterwards compact.

Very common.

1865. June 4.	1869. June 10.	1873. June 20.
1866. June 28.	1870. June 3.	1874. June 12.
1867. June 12.	1871. June 11.	1875. June 5.
1868. June 2.	1872. June 15.	1876. June 24.

2. Anthoxanthum Linn.

1. **A. odoratum** Linn. *Vernal Grass.*

Bab. 412. Hook. 430. Benth. 527.

Woods and pastures. P. April to September.

Stems about a foot high; spikelets 1-flowered, arranged in a rather close spike, often interrupted below; stamens 2, anthers purple when growing in meadows, dull yellow in woods; rudimentary flowers 2, awned on the back.

Very common.

1865. nearly out Ap. 22.	1869. Ap. 20.	1873. June 20.
1866. Ap. 30.	1870. May 12.	1874. June 12.
1867. Ap. 26.	1871. June 25.	1875. full May 3.
1868. Ap. 22.	1872. June 15.	1876. May 3.

3. Phleum Linn.

1. **P. pratense.** *Timothy Grass.*

Bab. 413. Hook. 427. Benth. 529.

Meadows. P. June to September.

Rootstock somewhat creeping, or slightly tuberous. Stems from 6 to 12 inches high, but often more; spikelets 1-flowered, crowded into a dense spike; glumes compressed, keeled, with a short awn.

Very common.

1865. June 4.	1869. June 10.	1873. June 12.
1866. June 14.	1870. June 14.	1874. June 12.
1867. June 14.	1871. June 1.	1875. June 12.
1868. ———	1872. June 13.	1876. June 15.

4. Aleopecurus Linn.

Spikelets 1-flowered; glumes compressed, membranous, awnless, pale 1, awned on the back; spikelets arranged in dense spikes.

Spike tapering, glumes nearly glabrous ... ... 4 agrestis.

Spike cylindrical, glumes ciliate.

Stem erect, awn about twice as long as the pale; anthers yellow ... ... 1 pratensis.

Stem procumbent, at base, awn nearly twice as long as pale; anthers violet yellow ... ... 2 geniculatus.

Stem procumbent, awn a little exceeding the pale; anthers orange. ... ... 3 fulvus.

1. A. pratensis Linn. *Fox-tail Grass.*

Bab. 413. Hook. 428. Benth. 530.

Pastures. P. Ap. to July.

Rootstock scarcely creeping; stems from 1—3 feet high, erect, or slightly decumbent at the base; glumes with short hairs on the keel, which give the spike a soft appearance; awns very distinct.

Very common.

1865. nearly out Ap. 22.	1869. (Mch. 25.) Ap. 12.	1873. Ap. 3.
1866. Ap. 15.	1870. Ap. 19.	1874. Ap. 1.
1867. Ap. 18.	1871. Ap. 8.	1875. full May 3.
1868. Ap. 14.	1872. Ap. 4.	1876. May 4.

2. A. geniculatus Linn. *Floating Fox-tail Grass.*

Bab. 414. Hook. 429. Benth. 531.

Wet places. P. May to Sep.

Stems procumbent at the base and rooting at the joints; sheaths of the upper leaves inflated; spikes dense, smaller, with the awns not nearly so long as in the last; anthers linear, ultimately violet yellow.

Common.

1865. June 12.	1869. full June 8.	1873. June 8.
1866. May 29.	1870. May 27.	1874. June 6.
1867. May 26.	1871. May 17.	1875. June 5.
1868. June 2.	1872. May 26.	1876. June 1.

3. A. fulvus Sm.

Bab. 414. Hook. 429. Benth. 531. (*A. geniculatus* var.)

Wet margins of ponds. P. May.

Very similar in appearance to the last, but glaucous, the sheaths more inflated, the leaves broader, awn from below the middle (not the base) of the pale and scarcely reaching beyond it, anthers short and broad, at first white, afterwards orange coloured.

Near Swindon Reservoir. *W. D. Fenning.*

4. A. agrestis Linn. *Black Grass.*

Bab. 414. Hook. 428. Benth. 530.

Fields and roadsides. A. May to Nov.

Stem 1 to 2 feet high, roughish above; spike tapering; glumes glabrous; awn from near the base of the pale. Spike not so crowded as in the other species, and this with its more pointed form at once serves as a means of distinguishing it.

Common. A troublesome weed.

1865. May 1.	1869. Ap. 20.	1873. May 4.
1866. June 6.	1870. May 18.	1874. May 9.
1867. June 5.	1871. May 9.	1875. May 17.
1868. May 13.	1872. May 17.	1876. May 27.

5. Milium Linn.

4. M. effusum Linn. *Millet Grass.*

Bab. 415. Hook. 433. Benth. 524.

Damp shady woods. P. May, June.

Rootstock creeping; stems from 3 to 4 feet high, slender, leafy; leaves broad, flat and thin; spikelets small, ovate, 1 flowered, in a large lax panicle, the branches long and slender, arranged in whorls, deflexed after flowering.

An extremely elegant, but not very conspicuous grass. It occurs in almost all the woods and copses.

1865. May 3.	1869. May 1.	1873. May 31.
1866. May 10.	1870. May 18.	1874. May 5.
1867. May 9.	1871. May 12.	1875. May 15.
1868. May 6.	1872. May 20.	1876. May 19.

6. Phragmites Trin.

1. P. communis Trin. *Reed.*

Bab. 416. Hook. 440. Benth. 562. (*Arundo Phragmites*).

Marshes. P. Aug. to Oct.

Rootstock extensively creeping; stems from 5 to even 10 feet high; leaves broad flat, rigid, glaucous beneath, spikelets from 4 to 6 flowered with from 1—3 imperfect ones below; lower pale much exceeding the inner, and prolonged into a short awn; the perfect flowers with numerous silky hairs at their base, which increase considerably in length; spikelets in a large panicle, sometimes as much as a foot long, purplish brown and very conspicuous.

Not common. Poulton and Mildenhall.

7. Agrostis Linn.

The two species yet detected about Marlborough are plants from 6 inches to 2 feet high, with spreading stems decumbent at the base; the spikelets 1 flowered with 2 nearly equal glumes at the base; pales rarely awned.

Panicle spreading during and after flowering, ligule short 1. vulgaris.

Panicle compact after flowering, ligule long ... ... 2. alba.

1. A. vulgaris With. *Bent-Grass.*

Bab. 418. Hook. 431. Benth. 533. (*A. alba*).

Rather dry places. P. June to Oct.

Stems smooth, leaves short, sheaths smooth, ligule short, blunt; panicle remaining open after flowering.

Common.

1870. June 24.	1873. June 20.	1875. June 19.
1871. June 8.	1874. June 30.	1876. June 29.

2. **A. alba** Linn. *Fiorin-Grass.*

Bab. 418. Hook. 432. Benth. 533.

Fields, &c. P. June to Sep.

A larger and coarser plant, with rough sheaths and long acute ligules; after flowering the panicle closes up; the whole plant has usually a greenish tinge, the former a much more reddish tinge.

Common.

1871. June 17. 1876. July 5.

1873. July 17.

8. Holcus Linn.

Spikelets 2 flowered, the lower perfect, awnless, the upper usually male, with a dorsal awn; the spikelets arranged in a rather crowded panicle. Whole plant covered with soft down, whence the appropriate name of *Soft-Grass.*

1. **H. lanatus** Linn. *Soft-Grass. Yorkshire Fog.*

Bab. 419. Hook. 439. Benth. 540.

Meadows. P. May to Nov.

Tufted; stems from 1 to 2 feet high; the knots downy, not hairy; inflorescence often pinkish; lower flower awnless; upper glume blunt; awn quite smooth or slightly rough at the point, ultimately curved like a fish-hook and included within the glumes.

Very common.

1865. by May 25. 1869. May 15. 1873. May 21.

1866. June 13. 1870. May 21. 1874. May 26.

1867. May 15 1871. June 18. 1875. May 26.

1868. Ap. 21, May 19. 1872. May 10. 1876. May 14.

2. **H. mollis** Linn. *Creeping Soft-Grass.*

Bab. 419. Hook. 439. Benth. 540.

Thickets. P. June to Oct.

Very similar to the last, but the stems are creeping, the knots with distinct hairs (bearded); the inflorescence greenish; lower flower generally awnless; upper glumes acute, awn ultimately bent and protuding beyond the glumes; it is generally a smaller plant than the last, and the panicle is decidedly smaller.

Not uncommon.

1869. June 10. 1873. June, 27. 1875. July 1.

1870. June 14. 1874. ——— 1876. June 29.

9. Aira Linn.

Plants differing enormously in size, from a few inches to as much as 4 feet high. Spikelets small, 2 flowered in panicles. Glumes equalling or overtopping the flowers; lower pale with a dorsal awn; bent in the middle.

Panicle very loose, with spreading branches.

Stems 2 to 4 feet high; leaves flat and rough, awns shorter than the flowers	1. cæspitosa.
Stems 12 to 18 inches high, leaves rolled in on the edges, awns protruding	2. flexuosa.
Stems 4 to 6 inches high, leaves fine and short, awns protruding...	3. caryophyllea.
Panicle dense and narrow—stem 3 to 6 inches high	4. præcox.

1. A. cæspitosa Linn. *Tufted Hair-grass.*

Bab. 419. Hook. 436. Benth. 537.

Meadows, thickets, &c. P. June to Sep.

A tall perrenial, forming large tufts with rather stiff, flat leaves, very rough on the upper surface. Stems from 2 to 4 feet high, with large loose panicles at their summits; glumes membranous and shining, enclosing the flowers: awn straight, from below the middle of the pale and scarcely extending beyond it.

Very common.

1865. bud, June 7.	1869. June 10.	1873. June 10.
1866. June 28.	1870. June 13.	1874. June 12.
1867. June 20.	1871. ———	1875. June 5.
1868. nearly out, June 8.	1872. June 24.	1876. June 23.

2. A. flexuosa Linn. *Waved Hair-grass.*

Bab. 420. Hook. 436. Benth. 537.

Heathy places. P. June, July.

A very much smaller plant than the last: stems from 1 to 2 feet high; leaves very narrow and rolled inwards so as to appear hair-like; upper sheaths rough from above downwards; panicle rather small; its branches slender and wavy; glumes shining; awns bent from near the base of the pale and exceeding it.

Scarce. Martinsell; West Woods; Bedwyn.

3. A. caryophyllea Linn. *Silvery Hair-grass.*

Bab. 420. Hook. 437. Benth. 538.

Dry gravelly places. A. June.

Small tufted annuals, from 3 to 6 inches high, with narrow hair-like leaves; sheaths roughish from below upwards; panicle spreading, triply forked; spikelets small, chiefly collected at the ends of the branches, awn from below the middle of the pale, and extending considerably beyond it.

Scarce. Has only been detected on Marlborough Common by *E. F. im Thurn*; in the West Woods; and at Rockley, *Rev. J. Sowerby*.

4. A. præcox Linn. *Early Hair-grass.*

Bab. 420. Hook. 437. Benth. 537.

Dry and sandy places. A. May.

Very similar, especially in its earlier stages to the last, but when properly in fl. the panicle is very close, almost spike-like, sheaths of the leaves smooth.

Has only been found in Savernake Forest.

9. Trisetum Pers.

1. T. flavescens Beauv. *Yellow Oat-grass.*

Bab. 420. Hook. 438. Benth. 539 (*Avena*).

Fields. P. June to Oct.

This is generally included under *Avena* from which it differs in its ovary being glabrous, whilst that of *Avena* is hairy at the top.

Stems tufted, about 2 feet high: panicle much branched, often 3 or 4 inches long, the spikelets much smaller than in *Avena*, shining and often of a yellowish hue; awns slender, 3 in each spikelet.

Common.

1865. June 5.	1869. June 8.	1873. May 31.
1866. June 14.	1870. June 7.	1874. June 12.
1867. June 8.	1871. June 8.	1875. June 1.
1868. June 1.	1872. June 4.	1876. June 9.

10. Avena Linn.

Similar in structure to *Aira* in all essential characters; the spikelets are much larger, with from 2 to 6 flowers; lower pale awned and ending in two points; awn kneed and twisted; spikelets panicled.

1. A. pratensis Linn. *Narrow-leaved Oat-grass.*

Bab. 421. Hook. 438. Benth. 538.

Dry pastures. P. May to July.

Tufted; stem from 1 to 2 feet high; leaves glaucous, short, narrow, acute, the sheaths rough not hairy; panicle branches usually simple with only one spikelet; glumes membranous, glistening.

Common.

1865. ———	1869. May 20.	1873. May 22.
1866. ———	1870. May 20.	1874. by May 9.
1867. June 14.	1871. by June 11.	1875. May 17.
1868. May 24.	1872. May 5.	1876. June 15.

2. A. pubescens Linn. *Downy Oat-grass.*

Bab. 421. Hook. 438. Benth. 539. (*A. pratensis*).

Dry pastures. P. May, June.

Rather creeping; stems about 2 feet high; leaves not glaucous, lower sheaths hairy; panicle branches more branched than in *pratensis*; similar to the last in general appearance.

Common.

1865. May 12.	1869. May 21.	1873. May 13.
1866. ———	1870. May 18.	1874. May 9.
1867. May 17.	1871. May 7.	1875. May 13.
1868. May 13.	1872. May 11.	1876. May 19.

12. Arrhenatherum Paul de Beauv.

1. A. elatius M. & K. *False-Oat.*

Bab. 422. Hook. 439. (*Avena elatior*), Benth. 539. (*A. avenaceum*).

Hedges and pastures. P. May to Nov.

Rootstock creeping; often tuberous; stems from 2 to 4 feet high, not densely tufted; leaves flat, rough, sheaths smooth; spikelets in panicles, 2 flowered, the lowest having only stamens and an awn, about twice its length, from the back of the outer pale, the upper generally awnless; panicle long, narrow and drooping: like *Avena* in appearance with which it is often united.

Common.

1865. May 29.	1869. May 27.	1873. May 31.
1866. by June 13.	1870. May 21.	1874. May 30.
1867. June 8.	1871. about June 20.	1875. June 1.
1868. May 20.	1872. May 24.	1876. June 11.

13. Triodia R. Br.

1. T. decumbens Beauv. *Heath-grass.*

Bab. 422. Hook. 440. Benth. 560.

Dry places and heaths. P. July.

Tufted; stems from 6 inches to 1 foot high; leaves short, narrow, rather hairy, and with a tuft of hairs instead of a ligule; spikelets few, oval; glumes thick and leathery, without awns, almost covering the 4 flowers. Spikelets in a simple raceme.

Savernake Forest.

This plant is said to indicate extreme poverty in the soil.

14. Kœleria Pers.

1. K. cristata Pers. *Crested Hair-grass.*

Bab. 422. Hook. 441. Benth. 561.

Dry pastures. P. June, July.

Tufted; stem from 6 to 12 inches high, downy in its upper part; leaves narrow, glabrous beneath, much shorter than the stem in dry places; spikelets 2 to 5-flowered, in clusters, crowded into a cylindrical spike, generally interrupted below; glumes unequal, toothed on the keel; pales white and shining, awnless; pales, glumes, and leaves are often downy, sometimes glabrous.

Common.

1865. May 26.	1869. May 25.	1873. June 7.
1866. about June 6.	1870. June 2.	1874. June 6.
1867. June 10.	1871. June 18.	1875. May 15,
1868. May 27.	1872. May 30.	1876. June 15.

15. Melica Linn.

1. M. uniflora Retz. *Melic Grass.*

Bab. 422. Hook. 441. Benth. 560.

Shady woods. P. May to July.

Creeping; stems from 1 to 2 feet high, slender, scaly below; leaves flat, slender, slightly hairy; spikelets with 1 perfect flower, in a lax drooping panicle, the few lowest branches with 2 or more flowers; glumes coloured.

Common.

1865. by May 13.	1869. April 30.	1873. June 1.
1866. Ap. 27.	1870. May 21.	1874. May 7.
1867. May 10.	1871. May 6.	1875. (May 16) full June 12.
1868. Ap. 30.	1872. by May 16.	1876. May 27.

16. Poa Linn.

Spikelets with from 2 to 7 flowers in a spreading or rather compact panicle. Glumes rather unequal, lower pale 3 to 5 veined, with a membranous tip, keeled and compressed, awnless.

Root fibrous.

Annual—panicle branches solitary or in pairs ... 1. annua.

Perennial—panicle branches in fives, or 2 or 3 together.

Three veins of lower pale hairy, ligule very short ... ... 2. nemoralis.

Only one vein hairy, ligule long ... ... 3. trivialis.

Root creeping.

Stem round, ligule prominent, panicle spreading 4. pratensis.

Stem compressed, ligule short, panicle compact... 5. compressa.

1. P. annua Linn. *Annual Meadow-grass.*

Bab. 423. Hook. 442. Benth. 556.

Cultivated and waste places. A. All the year.

Tufted; stems from 3 to 6 inches high, or higher if in damp watery places; upper sheath longer than its leaf, leaves broad, often wavy; ligule oblong; panicle spreading, with a triangular outline; spikelets of 5 or 6 flowers, without any woolly fibres between them.

Very common.

2. P. nemoralis Linn. *Wood Meadow-Grass.*

Bab. 424. Hook. 443. Benth. 557.

Shady places. P. June, July.

Stem slender, 1 to 2 feet high, decumbent at the base, upper sheath not longer than its leaf, sheaths smooth; uppermost knot at about the middle of the stem, exposed; ligule very short; panicle rather drooping; spikelets of 3 or 4 webbed flowers (*i.e.* connected together with cottony fibres, growing from the base of each flower); lower pale with 3 hairy veins.

Scarce.

3. P. trivialis Linn. *Rough Meadow-Grass.*

Bab. 425. Hook. 443. Benth. 557.

Moist and shady places. P. May to July.

Tufted; stems from 1 to 2 feet high; sheaths rough; ligule long, acute; panicle spreading, spikelets small, of 2 or 3 webbed flowers, pale with only the central vein hairy.

Common.

1865. by May 25.	1869. May 12.	1873. May 22.
1866. May 8.	1870. May 19.	1874. May 26.
1867. by June 4.	1871. May 17.	1875. May 17 (Woodborough).
1868. May 13.	1872. May 20.	1876. June 3.

4. P. pratensis Linn. *Common Meadow-Grass.*

Bab. 425. Hook. 442. Benth. 557.

Meadows and pastures. P. Ap. to Aug.

Rootstock creeping; stems about 1 or 2 feet high, upper sheath longer than its leaf, sheaths smooth; ligule prominent, blunt; leaves very variable in width, generally rather narrow; panicle spreading, spikelets of 3 or 4 webbed flowers, pale with 3 hairy veins.

Very common.

1865. May 7.	1869. Ap. 19.	1873. Ap. 28.
1866. May 6.	1870. Ap. 19.	1874. May 5.
1867. May 7.	1871. Ap. 29.	1875. full, May 3.
1868. Ap. 23.	1872. Ap. 13.	1876. May 7.

P. compressa Linn. *Flattened Meadow-Grass.*

Bab. 426. Hook. 443. Benth. 557.

Dry situations. P. July.

Creeping; stems about a foot high, decumbent at the base, much compressed; upper sheath about as long its leaf, ligule short; panicle slightly spreading when in flower, otherwise close; spikelets of about five to seven flowers generally slightly webbed; lower pale three-veined, all hairy.

Very scarce. Mildenhall.

17. Glyceria R. Br.

Tall aquatic plants; spikelets only slightly flattened; lower pale with five to seven strong prominent ribs, and a membranous margin, not keeled.

Panicle much branched, spreading, spikelets rather small 1. aquatica.

Panicle compound, spikelets long, anthers yellow ... 3. plicata.

Panicle slightly branched, spikelets long, anthers purple 2. fluitans.

1. G. aquatica Sin. *Great Water Reed-Grass.*

Bab. 426. Hook. 445. Benth. 555. (*Poa*).

Watery places. P. June to October.

Creeping; stems stout, from three to six feet high, smooth; leaves long, compressed, rough on the edges and keel, ligule short; panicle large, much branched, spreading, often nearly a foot long; spikelets of from five to ten flowers.

Common.

1868. June 8	1872. by June 15.	1875. June 19.
1869. June 19.	1873. July 1.	1876. June 29.
1870. June 11.	1874. June 12.	

2. G. fluitans R. Br. *Flote-Grass.*

Bab. 426. Hook. 445. Benth. 555. (*Poa.*)

Watery places. P. May to October.

Stems rather thick, but weak, often two or three feet long, but decumbent at the base, and rooting at the joints; leaves pale green, often floating; sheaths smooth, compressed, ligule three times as long as broad; panicle very long, slightly branched, close; spikelets about an inch long. of from seven to twelve flowers; lower pale about three times as long as broad; anthers long, purple.

Common.

1867. June 23.	1871. June 18	1874. ———
1868. May 19.	1872. May 3.	1875. May 22.
1869. May 15.	1873. June 7.	1876. May 27.
1870. by May 27.		

3. G. plicata Fries.

Bab. 426. Hook 445. Benth. 555. (*Poa fluitans.*)

Watery places. P. May to October.

Very similar to the last, with which it is often united, but the branches of the panicle are very much more branched, and the ligule is shorter; spikelets of from seven to twenty flowers, lower pale twice as long as broad, and the anthers yellow.

Common.

1865. June 4.	1869. June 10.	1873. June 3.
1866. ———	1870. by May 26.	1874. June 6.
1867. June 5.	1871. June 1.	1875. May 22.
1868. May 1.	1872. May 9.	1876. June 15.

18. Sclerochloa Paul de Beauv.

1. S. rigida Link. *Hard Meadow Grass.*

Bab. 428. Hook. 446. (*Glyceria*) Benth. 556. (*Poa.*)

Dry places. A. June.

A tufted annual; stems about six inches high, decumbent at the base, wiry; leaves nearly flat; panicle about two inches long, one-sided, crowded, nearly simple; spikelets very narrow, of from seven to ten flowers.

Has been found at Martinsell; Forest Hill, *H. R. Armstrong*; Axford; and Rabley.

19. Briza Linn.

1. B. media Linn. *Quaking Grass.*

Bab. 429. Hook. 446. Benth. 553.

Pastures. P. May to July.

Stems slightly creeping, solitary, slender, erect, from 12 to 18 inches high; leaves flat, narrow, few except at the base of the stem; ligule very short; panicle very lax, branches very slender, terminated by rather large spikelets; glumes nearly equal; spikelets ovate, of about five flowers, usually purplish.

Common.

1865. May 22.	1869. May 22.	1873. May 30.
1866. June 2.	1870. May 25.	1874. May 19.
1867. May 18.	1871. May 19.	1875. May 17 (Woodborough)
1868. May 19.	1872. May 24, 30.	1876. May 27.

20. Catabrosa Paul de Beauv.

1. C. aquatica Beauv.

Bab. 428. Hook. 444. Benth 559.

Ponds and ditches. P. May to July.

Creeping; stems long, procumbent or floating, rooting at the joints, then erect; leaves short, rather broad, flat and flaccid; panicle long, consisting of many half whorls of spreading branches; spikelets of about two flowers; glumes broad, flat or slightly jagged at the top, very thin, often purplish.

Not common. Woodborough, *Rev. J. Sowerby*; Mildenhall, *F. J. H. Jenkinson*; Row Down; Binck Knoll.

21. Cynosurus Linn.

1. C. cristatus Linn. *Dog's-tail Grass.*

Bab. 429. Hook. 452. Benth. 552.

Pastures. P. May to October.

Tufted; stems from 12 to 18 inches high, wiry, erect; leaves tufted, narrow, rather rigid. Inflorescence very peculiar, appearing at first sight like a spike, with a comb-like bract beneath each spikelet or pairs of spikelets, and all turned to one side. This bract is really a spikelet of barren flowers; fertile spikelets of from three to five flowers, shorter than the barren spikelets; glumes wanting in the barren spikelets, nearly equal in the fertile ones; lower pale with a very short awn or point.

Common.

1865. June 3.	1869. May 27.	1873. May 25.
1866. About June 6.	1870. May 26.	1874. June 6.
1867. June 8.	1871. by June 18.	1875. June 1.
1868. May 25.	1872. May 31.	1876. June 6.

22. Dactylis Linn.

1. D. glomerata Linn. *Cock's-foot Grass.*

Bab. 429. Hook. 441. Benth. 552.

Meadows and waste ground. P. May to Nov.

A very coarse grass, tufted, stems from 1 to 2 feet high, erect; leaves flat, with rough margins; spikelets flattened, with from 3 to 5 flowers, collected into dense one-sided clusters, and these again into a close spike or long broken spike or at the ends of the branches of a spreading panicle. Glumes strongly keeled, lower pale sending in a short awn.

Common.

1865. May 8.	1869. Ap. 29.	1873. May 2.
1866. May 15.	1870. May 14.	1874. May 9.
1867. May 16.	1871. May 8.	1875. May 17. (Woodborough)
1868. May 13.	1872. Ap. 28.	1876. May 13. (Savernake) May 20.

23. Festuca Linn.

Spikelets with 2 or more flowers; lower pale ending in an awn sometimes very small; glumes unequal; sheaths of the leaves divided to the base.

Leaves very narrow.

Awn longer than the pale, stamens 1 ... ... 1 sciuroides.

Awn shorter than the pale stamens 3

Leaves all hair-like ... ... 2 ovina.

Stem leaves flat ... ... 3. rubra.

Leaves broad and flat

Awn twice as long as the pale ... ... 4 gigantea.

Awn short

Panicle branches in pairs, each with 2 or more spikelets ... ... 5 arundinacea.

Panicle branches in pairs, one bearing a single spikelet ... ... 6 pratensis.

Spikes solitary, sessile ... ... var loliacea.

1. F. sciuroides Roth. *Rat's-tail Fescue.*

Bab. 429. Hook. 449. Benth. 551. (*F. Myurus.*)

Walls and sandy places. A. June.

Tufted annuals, with stems from 6 to 12 inches high; leaves all hair-like; spikelets in an erect panicle, branched in its lower part, sometimes reduced to a spike; and all turned to one side; glumes very unequal, lower pale with a long awn; flowers usually monandrous.

Scarce. Lockeridge, *Rev. J. Sowerby*; West Woods; Woodborough; Pewsey.

2. F. ovina Linn. *Sheep's Fescue.*

Bab. 430. Hook. 448. Benth. 550.

Dry Pastures. P. May to July.

Densely tufted; stems from 1 to 2 feet high; panicle rather compact, slightly one-sided; spikelets of 4 to 6 flowers, mostly awned: a variable plant.

Common.

1865. May 2.	1869. May 21.	1873. May 13.
1866. May 15.	1870. May 19.	1874. May 9.
1867. May 18.	1871. May 12.	1875. (May16.)May17.
1868. full June 8.	1872. May 5.	1876. May 20.

3. F. rubra Linn. *Creeping Fescue Grass.*

Bab. 430. Hook. 448. Benth. 550. (*F. ovina*).

Dry places. P. May to July.

Similar to the last, but the stem leaves are flat, the lowest sheaths hairy; it is less densely tufted, and the rootstock is creeping: a variable plant.

Common.

1865. by June 5.	1869. May 7.	1873. May 7.
1866. after May 15.	1870. May 18.	1874. May 12.
1867. May 17.	1871. May 9.	1875. May 17.
1868. May 13.	1872. May 9.	1876. May 8.

4. F. gigantea Vill. *Giant Fescue-Grass.*

Bab. 431. Hook. 448. Benth. 549. (*Bromus*).

Moist woods and thickets. P. July to Oct.

Stems from 3 to 4 feet high, erect, glabrous; leaves long, broad, roughish on both sides; panicle long, loose, drooping, branched; spikelets of about 5 flowers; glumes unequal, lower pale ending in a long rough awn.

Commonly distributed.

1869. June 8.	1873. July 10.	1875. June 26.
1870 July 2.	1874. June 30.	1876. full July 29.

5. F. arundinacea Schreb. *Tall Meadow Fescue-Grass.*

Bab. 431. Hook. 447. (*F. elatior*). Benth. 551. (*F. elatior var*).

Damp pastures. P. June to Sep.

Rootstock creeping; stems from 2 to 6 feet high; leaves rather narrow, glabrous; panicle branches mostly in pairs, each with 2 or more spikelets; spikelets of 5 to 6 flowers; lower pale ending in a short awn.

The form *F. elatior* Linn? is a very large plant, the panicle branches after flowering "ascending."

Not uncommon. *F. elatior* has occurred at Binck-Knoll and Great Bedwyn.

1869. June 8.	1872. ———	1874. June 12.
1870. June 6.	1873. June 28.	1875. June 5.
1871. by June 8.		1876. June 27.

6. F. pratensis Huds. *Common Meadow Fescue-Grass.*

Bab. 431. Hook. 447. Benth. 551. (*F. elatior var.*)

Wet meadows. P. June to Sep.

A smaller plant than the preceding, and less creeping; the spikelets of from 5 to 10 flowers, rather more distant, awn very short or wanting, and one of each pair of branches with only one spikelet.

The form *F. loliacea* Huds. has the spikelets sessile on alternate sides of the stalk, and not unlike *Lolium* in appearance, from which it may be known by its 2 glumes.

Common; *F. loliacea* rather scarce.

1870. June 17.	1873. June 10.	1875. June 1.
1872. June 13.	1874. May 30.	1876. June 29.

24. Bromus Linn.

Spikelets with several flowers; glumes unequal; lower pale with a long awn from below the tip; styles inserted on one side of the summit of the ovary; sheaths of the leaves divided half-way down.

Awns not longer than the glumes.

Panicle compact, erect	1. erectus.
Panicle loose, drooping	2. asper.
Awns much longer than the glumes	3. sterilis.

1. B. erectus Huds. *Upright Brome-Grass.*

Bab. 432. Hook. 450. Benth. 547.

Dry pastures. P. Ap. to Sep.

Rootstock creeping; stems from 2 to 3 feet high; leaves slightly hairy, narrow, lower ones rolled in on their edges; panicle erect, nearly simple; spikelets of 6 or more, rather distant flowers, cylindrical, often purplish; pales hairy, twice as long as the awn.

Common.

1865. May 27.	1869. Ap. 27.	1873. May 3.
1866. ———	1870. May 18.	1874. Ap. 29.
1867. May 19.	1871. May 6.	1875. by May 3.
1868. May 19.	1872. Ap. 30.	1876. May 13.

2. B. asper Murr. *Hairy Brome-grass.*

Bab. 432. Hook. 449. Benth. 547.

Hedges and thickets. A. or P. May to Sep.

Root fibrous; stem from 4 to 5 or even 6 feet high; leaves long flat, hairy, the sheaths hairy with downward hairs; panicle loose, drooping; spike-

lets lanceolate, of 6 to 10 distant flowers, closed after flowering; palea twice as long as the awn.

Not uncommon.

1865. June 7.	1869. May 21.	1873. May 31.
1866. ———	1870. June 9.	1874. May 9.
1867. June 20.	1871. about June 20.	1875. June 12.
1868. June 16.	1872. May 20.	1876. June 11.

3. B. sterilis Linn. *Barren Brome-Grass.*

Bab. 432. Hook. 450. Benth. 548.

Waste places. A. May to Oct.

Stems from 1 to 2 feet high; leaves broad, flat, pubescent; panicle drooping, with long, slightly divided branches; spikelets of 6 or 8 flowers; lower pale glabrous, much shorter than its awn; the spikelets remain open after flowering, so that they are always broader above than below, often 2 inches long, including the awn.

Common.

1865. May 7.	1869. May 7.	1873. Ap. 25.
1866. full June 28.	1870. May 12.	1874. May 4.
1867. nearly May 7, full May 23.	1871. Ap. 30.	1875. by May 3.
1868. May 18.	1872. Ap. 30.	1876. May 9.

25. Serrafalcus Parl.

Differs from *Bromus* in its oblong, turgid flowers, lower pale with a short awn from below the tip, and the sheathes of the leaves scarcely divided half way down.

A very important character is the edge of the lower pale, which is either uniformly rounded, or has a distinct angle.

Lower pale uniformly rounded.

Panicle drooping ... ... 1. secalinus.

Panicle erect ... ... 2. racemosus.

Lower pale bluntly angular.

Panicle drooping ... ... 3. commutatus.

Panicle erect ... ... 4. mollis.

1. S. secalinus Bab. *Rye Brome-Grass.*

Bab. 433. Hook. 451. (*Bromus*). Benth. 549. (*Bromus arvensis* var.)

Cornfields. A. July.

Panicle loose, drooping in fruit; spikelets glabrous but not glossy; leaves glabrous or slightly hairy.

Occasionally in cornfields. Mildenhall; field on the top of Forest Hill, where a downy form has established itself.

2. S. racemosus Parl. *Smoth Brome-Grass.*

Bab. 433. Hook. 451. (*Bromus.*) Benth. 549. (*Bromus arvensis* var).

Pastures. B. June.

Panicle erect, usually simple; spikelets rather glossy, closed even with fruit; leaves and sheaths slightly hairy.

Common.

3. S. commutatus Bab. *Field Brome-Grass.*

Bab. 433. Hook. 451. (*Bromus racemosus* var.) Benth. 548. (*Bromus arvensis* var.)

Pastures. B. June, July.

Panicle loose, slightly drooping, compound; lower pale twice as long as broad, glabrous or downy. Generally considered to be a form of the last: according to Babington the anthers are much longer in this than in *racemosus*.

Common.

4. S. mollis Parl. *Lop Grass.*

Bab. 434. Hook. 451. (*Bromus*). Benth 546. (*Bromus arvensis* var).

Pastures and waste ground. A. Ap. to Nov.

Panicle close, erect, compound (rarely simple), pubescent, rarely glabrous; leaves and sheaths hairy or downy.

Common.

1865. (Ap. 25) May 7.	1869. Ap. 29.	1873. Ap. 25.
1866. May 9.	1870. May 12.	1874. Ap. 29.
1867. May 2.	1871. Ap. 19.	1875. full May 3.
1868. Ap. 22, May 13.	1872. Ap. 12.	1876. May 4.

26. Brachypodium Paul de Beauv.

Spikelets sessile, arranged alternately on each side of a stalk, indented to receive them; the edges of the glumes next the stalk. Glumes unequal.

Spike drooping, awn longer than the pale ... ... 1. sylvaticum.

Spike erect; awn shorter than the pale... ... ... 2. pinnatum.

1. **B. sylvaticum** R. & S. *False Brome-Grass.*

Bab. 434. Hook. 452. Benth 546.

Woods and hedges. P. June to Oct.

Root fibrous; stems few, 1 to 2 feet high; leaves flat, narrow, flaccid, hairy; spikelets of from 8 to 16 flowers, cylindrical when young, flattened in fruit; glumes pubescent or glabrous, pales hairy ending in an awn longer than the pale.

Common.

1870. June 21. 1873. June 20. 1875. June 24.
1872. June 15 (?) 1874. June 12. 1876. June 29.

2. **B. pinnatum** Beauv. *Heath False Brome-Grass.*

Bab. 435. Hook. 453. Benth. 546.

Dry chalky Downs. P. July.

Rootstock creeping; stems several, one to two feet high; leaves flat, narrow, rigid, almost glabrous; spikelets cylindrical when young; spikes erect; pales rough or hairy, larger than the awns.

At Binck Knoll, and on the Downs beyond Rockley.

27. Triticum Linn.

Differs from *Brachypodium* by its equal glumes.

1. **T. caninum** Huds.

Bab. 435. Hook. 453. Benth. 545.

Banks. P. June.

Root fibrous; stems several, slender, 1 to 3 feet high; leaves flat, rough on both sides; spikelets of from 2 to 8 flowers, lower pale shorter than its awn.

Copse near Granham Farm.

2. **T. repens** Linn. *Couch Grass.*

Bab. 435. Hook. 453. Benth. 544.

Fields and waste places. P. June to Oct.

Rootstock extensively creeping: stems from 1 to 3 feet high, stiff, erect, glabrous; leaves very variable, flat or rolled in on their edges, glabrous or hairy: spikelets of 4 to 6 flowers, very rigid; glumes rough on the keel; pales all similar, narrow and stiff, usually pointed, sometimes ending in an awn.

Very common.

1865. June 9. 1871. about June 20. 1875. June 5.
1866. June 28. 1873. June 24. 1876. June 27.
1870. June 9. 1874. full, June 16.

28. Hordeum Linn.

1. H. pratense Huds. *Meadow Barley.*

Bab. 436. Hook. 456. Benth. 543.

Damp meadows. P. June, July.

Rootstock creeping; stems very slender, 1 to 2 feet high; leaves narrow, flat, at length rolled in on their edges, hairy; spikelets 3 together, sessile, on alternate notches of a simple spike, the 2 outer barren, the central with a fertile flower, completely enveloped in the lower pale, which is lengthened out into an awn about as long as the pale; the glumes are all reduced to awns, and thus the flower is apparently surrounded by an involucre of awns.

Not uncommon.

1870. Full June 21. 1873. June 28.

1871. June 18.

29. Lolium Linn.

1. L. perenne Linn. *Rye-grass.*

Bab. 437. Hook. 454. Benth. 545.

Fields and waste places. P. May to Nov.

Root fibrous; stem from 12 to 18 inches high, usually bent below, glabrous; edges of the young leaves simply folded; spikelets arranged in a simple spike, with the back of the pales next the stalk; spikelets of from 3 to 11 flowers; glume solitary, of various length, but never so long as the spikelets; lower pale usually awnless.

Sometimes the spikelets become converted into branches, or the main stalk is shortened so as to produce a broad ovate spike.

Very Common.

1865. May 8.	1869. May 1.	1873. May 6.
1866. May 4.	1870. May 12.	1874. May 4.
1867. May 7.	1871. Ap. 25.	1875. May 15.
1868. May 4.	1872. Ap. 30.	1876. June 10.

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It is now 6 years since the Flora, which is just completed, was commenced, and during that time not only have several more species been detected, but also a fresh Edition of Babington's Manual has appeared, and consequently the references to that work in the earlier parts of this Flora are incorrect. The Flora, therefore, as it stands, is not only incomplete, but from an accidental omission, very few entire copies are in existence. A thorough revision is therefore necessary, but it will clearly be very unwise to attempt a reprint unless a certain number of copies can be sold to ensure against any great loss. Should a sufficient number of subscribers come forward, the work will be put in hand and brought out in as complete a form as possible, and as soon as circumstances will allow. I should feel obliged by those who are inclined to aid by taking a copy (the price of which it is hoped will be kept down to 5s.) sending their names to me, at the College, Marlborough.

T. A. PRESTON.